NUCLEAR SCIENCE ABSTRACTS

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NUCLEAR SCIENCE ABSTRACTS

Volume 13 Number 7 April 15, 1959

GENERAL

4375 KAPL-M-EDL-66

Knolls Atomic Power Lab., Schenectady, N. Y.

MARK A LIQUID METAL SCRAPER SEAL MATERIALS COMPATIBILITY TEST. P. E. Bissonnette and E. C. Reynolds. Feb. 25, 1954. Changed from OFFICIAL USE ONLY Nov. 21, 1957. 31p. Contract [W-31-109-Eng-52]. $6.30(ph OTS); $3.00(mf OTS).

An axially reciprocating shaft was operated in liquid Na against split metallic seals using various combinations of materials as the shaft and seals. The purpose of the tests was to determine which materials in combination would be suitable for use in liquid Na at temperatures up to 850°F. Three materials were found to be compatible: No. 18-4-1 high-speed tool steel vs. nitrided type 347 stainless steel; nitrided type 347 stainless steel vs. nitrided type 347 stainless steel; and nitrided type 347 stainless steel vs. 440°C hardened stainless steel. (W.L.H.)

4376 AEC-tr-3433

REPORT ON THE EGYPTIAN ATOMIC ENERGY COMMISSION FOR THE YEAR 1957: ITS CREATION, PROGRAMS, AND ACTIVITIES. Translation of a publication of the Egyptian Atomic Energy Commission, Cairo Univ. Press, 1957. 91p. $1.75(OTS).

The status of the development of nuclear technology in Egypt in 1957 is reviewed. The long-range development plans of the Atomic Energy Commission are outlined. Progress is reported in all phases of the program. The Radioactive Isotopes Center at Dekka was completed, and construction of a nuclear physics laboratory was under way. A training program was under way, and projects aimed at the national stimulation of interest in atomic energy are reported. The use of radioactive isotopes in medicine was centralized in three medical units equipped for handling radioactive materials and training personnel. A weekly average is reported of 100 cases diagnosed and 14 cases treated with radioisotopes. Radioisotope facilities were also established for research in agriculture and public health, and the use of radioisotopes for material testing was supervised. The handling of all radioactive materials and disposal of radioactive wastes is supervised by the Commission. An electronics laboratory was in operation. Geological exploration for atomic metals was in progress. Plans for the installation of an atomic reactor are discussed. Publications, conferences, and training activities are listed. (C.H.)

4377

HIGH VACUUM TECHNIQUES FOR NUCLEAR INDUSTRY. D. J. Crawley. Atomic World 9, 423-6(1958) Dec.

The application of high-vacuum systems and techniques to nuclear research is discussed. Information is presented on: the application of the vacuum chamber to particle accelerators, pumps for accelerators, the uses of vacuum systems in separation plants, the application of vacuum systems to reactor heat exchangers, leak detection by vacuum techniques, vacuum metallurgy, and pumps for degassing. (J.H.M.)

4378

AIR-LIFT PUMPS IN MULTICOLUMN PLANTS. Andrew H. Fowler and George R. Jasny (Union Carbide Nuclear Co., Oak Ridge, Tenn.). Chem. Eng. Progr. 55, No. 1, 64-5(1959) Jan.

The air-lift pump in principle is a pipe submerged in a liquid with a connection near the bottom for injecting air. An arrangement for obtaining automatic transfer with air-lift pumps in multicolumn plants is shown. (W.L.H.)

4379

PRODUCTION OF Co^{60} SURFACE SOURCES BY ELECTROLYSIS OF COBALT SOLUTIONS CONTAINING NITRATE. Rudolf Münze and Günther Reinhard (Zentralinstitut für Kernphysik, Dresden). Chem. Tech. (Berlin) 10, 662(1958) Nov. (In German)

A method for the direct precipitation of Co^{60} sources from dilute cobalt nitrate solutions is given. The cobalt is deposited on the cathode in a thin black layer. The conditions used in the electrolysis are described. (J.S.R.)

4380

PROTECTIVE COATINGS. Harry Burrell (Interchemical Corp., Cincinnati). Ind. Eng. Chem. 51, No. 1, 53A, 56A(1959) Jan.

A general review of the development of satisfactory water-based industrial coatings is presented. (J.E.D.)

4381

THE USE OF RADIOACTIVE ISOTOPES FOR DETERMINING SATURATED VAPOUR PRESSURE. H. Nesmeyanov. Intern. J. Appl. Radiation and Isotopes 4, 16-29(1958) Dec.

This paper was previously abstracted from the original language and appears in NSA, Vol. 12, as abstract No. 10560.

4382

NATIONAL POWER PROGRAMMES, A WORLD SURVEY. Nuclear Power 4, 92-112(1959) Jan.

The second Geneva Conference and the sectional meeting of the World Power Conference held at Montreal have together made it possible to get a much better idea of different nuclear power programs. This review is designed to indicate what these programs are and to relate them to each country's economic and geographical conditions, while at the same time measuring the amount of supporting effort being put into nuclear energy research and development. A country-by-country survey is given. (W.D.M.)

4383

PROSPECTS FOR FOOD IRRADIATION. Nuclear Power 4, 121(1959) Jan.

Prospects for preserving food on a commercial scale by radiation treatment cannot be rated very high at present, although there does seem quite a good chance that in combination with other processes it might have an economic future. This is the conclusion from the five-day symposium on the subject held at Harwell (Nov. 17-21, 1958) under the auspices of the Food and Agriculture Organization of the U.N. (W.D.M.)

4384

RADIATION-RESISTANT LUBRICANTS. C. H. Nailer. Nuclear Power 4, 132(1959) Jan.

A wide range of special lubricants has been developed in the UK over recent years for use in power plants and nuclear processing facilities. Some typical applications include gas circulators, gas valves, control-rod drive units, reactor fueling machines, remote handling equipment, fault detection equipment, and processing plant equipment. (W.D.M.)

4385

MEASUREMENT OF THE RADIOACTIVITY OF THE AIR IN THE ANTARCTIC. E. Picciotto (Univ. of Brussels). Nuovo cimento (10) 10, 190-1(1958) Oct. 1.

Preliminary results of measurements of air radioactivity by the Belgian Antarctic Expedition at Base Roi Baudouin (70° 26′ S and 24° 19′ E, about 10 km from the sea) since February 1958 are given. The air was collected 10 m above the ground and drawn at a known rate through a filter which retained particles above 0.5 μm. The alpha and beta activity of the filters was measured during and after use. Beta activity (artificial radioelements) ranged from $\sim 1 \times 10^{-14}$ to 4×10^{-14} counts/m^3, the average being 2×10^{-14}. No correlation with meteorological conditions was observed. The beta activity of half life greater than 10 days was attributed to fission products. Alpha activity (natural radioelements) from ThB and RaB was measured, the latter being considered as in equilibrium with atmospheric Rn. An alpha activity with a half life of over 10 days was detected, probably Po. The results reported are: RaB $< 10^{-12}$ c/m^3; ThB $< 5 \times 10^{-14}$ c/m^3; and Po $< 10^{-16}$ c/m^3. The RaB and ThB values are considered as upper limits because of possible contamination from the insides of the base buildings where activities of 10^{-11} c/m^3 and 4×10^{-12} c/m^3 were found for RaB and ThB. No indication of elements with long half lives was found. (T.R.H.)

4386

A FIVE-YEAR PLAN FOR THE DEVELOPMENT OF NUCLEAR RESEARCH IN ITALY. Rome, National Committee for Nuclear Research, 1958. 98p.

Information is presented on the development of nuclear research in Italy by the National Committee for Nuclear Research. Committee activities concerned with the working out and preparation of a five-year research plan (1957 through 1962) are reviewed. Discussions are included on: basic research, applied research, geological and mining research, staff training, international activities, the National Synchrotron Laboratories, the Ispra Center, and radiobiological researches. (J.H.M.)

4387

FINE PARTICLE MEASUREMENT, SIZE, SURFACE, AND PORE VOLUME. Clyde Orr, Jr. and J. M. Dallavalle. New York, The MacMillan Company, 1959. 365. $10.50.

A detailed discussion of the important techniques currently used in research laboratories for the measurement of size, surface, and pore volume is presented. The theory and application of the measurements are treated, and a comprehensive description is provided of more than seventy techniques including automatic scanning, the fixed-time method, the Hauser-Lynn method, gravimetric analysis, and liquid-phase sorption. A bibliography of approximately 400 references complements the text. (W.D.M.)

BIOLOGY AND MEDICINE

4388 AD-200578

Georgia. Univ., Tifton. Georgia Coastal Plain Experiment Station.

TO DETERMINE THE EFFECT OF IRRADIATION ON THE WHOLESOMENESS OF FOOD. Progress Report No. 3 for March 22 to June 14, 1958. M. W. Hale, E. M. Ellis, and D. Sikes. 10p. Contract DA-49-007-MD-780.

Twelve dogs were fed a diet containing raw cabbage to the extent of 20% on a dry weight basis for 24 weeks. Four animals received control cabbage which was not irradiated, four dogs received cabbage irradiated at 2.79×10^5 rads, and four others received cabbage irradiated at 5.58×10^5 rads. All cabbage was maintained in the chill room at 4°C prior to feeding. Data presented for these animals indicate at this time no difference due to treatment with respect to growth, feed efficiency, hemoglobin, packed cell volume, and total white cell count. Eleven dogs were fed a diet containing bacon to the extent of 35% on a dry weight basis for a period of 50 weeks. Four animals received the control unirradiated bacon which was maintained in a frozen condition prior to feeding, four dogs received bacon irradiated at 2.79×10^6 rads, and three others received bacon irradiated at 5.58×10^6 rads. The irradiated bacon was stored at room temperature (10 to 33°C) for a period of one year prior to feeding. Data presented for these animals indicate no difference due to treatment with respect to weight maintenance, hemoglobin, packed cell volume, total white cell count, and the onset of estrus. One female receiving the bacon irradiated at 5.58×10^6 rads died from causes other than the diet. (auth)

4389 AECU-3978

Brigham Young Univ., Provo, Utah.

CROSS RESPONSES. I. THE EFFECTS OF X-IRRADIATION UPON EMBRYONIC DEVELOPMENT IN THE PARADISE FISH, MACROPODUS OPERCULARIS. A. Lester Allen. [1958?]. 46p. Contract AT(11-1)-349. $7.80(ph OTS); $3.30(mf OTS).

A study was made of the effects of exposure to 1000 to 4000 r x radiation on the development of embryos of the Paradise fish, Macropodus opercularis. The various embryonic tissues were classified according to their radio-

sensitivity during the development period. Data are included on morphological, histological, and behavioral responses to irradiation. (C.H.)

4390 AF-SAM-57-61

School of Aviation Medicine, Randolph AFB, Tex.

LETHAL EFFECTS OF GAMMA RADIATION ON NEUROSPORA CONIDIA. Robert D. Gafford. July 1957. 20p.

Conidia of the ascomycete, Neurospora crassa, were exposed to varying doses of 1.1-Mev gamma radiation from a 1,200-curie Co^{60} source in aqueous suspension and in the lyophilized state. Plate counts made in the conventional manner were used to calculate survival percentages. Two processes, each with a characteristic target number and inactivation constant are effective in killing spores irradiated in aqueous suspension. Indirect evidence indicates that one process is best explained on the basis of a direct hit model. Only this process is effective in killing spores irradiated in the lyophilized state. The other, more effective process can best be explained on the basis of a diffusion model. The target number for this process is correlated with the average number of nuclei per cell. (auth)

4391 CEA-767

France. Commissariat à l'Énergie Atomique, Paris.

ETUDE DE LA CINETIQUE DE L'ÉLIMINATION DU STRONTIUM CHEZ LE RAT. (Study of the Kinetics of Strontium Elimination in the Rat.) M. J. Guilloux and G. Michon. Feb. 1958. 7p.

A kinetic study of strontium elimination was made on rats after a single oral administration of 3 to 5 μc of carrier-free Sr^{90}. The curve showing the body burden as a function of time may be considered as the sum of three exponential terms with half lives of 14 hours, 72 days, and 153 days. The term with a half life of 153 days represents the metabolism of strontium in the bone; it is predominant since the 17th day, and its extrapolation to time zero shows that things seem to proceed as if 18 per cent of the administered amount were deposited in the skeleton. (auth)

4392 COO-217

Utah. Univ., Salt Lake City. Coll. of Medicine.

SEMI-ANNUAL PROGRESS REPORT. C. N. Stover, Jr., ed. Sept. 30, 1958. 184p. Contract AT(11-1)-119. $28.80(ph OTS); $8.40(mf OTS).

Progress is reported in long-term studies on the toxic effects of radioactive heavy metals in dogs. Data are included on the pathological effects and clinical symptoms in dogs receiving plutonium-239, radium-226, radium-228, and strontium-90. Eye changes were observed in dogs following administration of radium-226. Data are tabulated on radium-226 concentration in various parts of the eye. Metabolism of lead-212 was studied in dogs following intravenous injection and after transfusion of lead-212-labeled blood cells. Studies on the excretion of strontium-85 and strontium-90 were continued. Average bone weights and radionuclide distributions were measured in whole bones from adult beagle dogs injected intravenously with plutonium, thorium, and radium. The distribution along the length of the humerus is graphed. A low-potassium diet was found to lower the serum potassium concentration more than it does whole-body potassium. Data are tabulated. Measurements were made of localized isotope concentration in skeletal tissues using densitometric techniques on quantitative autoradiograms. (For preceding period see COO-215.) (C.H.)

4393 NM-61-01-09.1.9

Naval Medical Field Research Lab., Camp Lejeune, N. C.

ACUTE BLOOD VOLUME CHANGES FOLLOWING FLASH BURN. J. P. Gilmore and H. A. Fozzard. Mar. 1958. 14p. (AD-200042).

Direct measurements of red cell mass, osmotic fragility change, and plasma hemoglobin immediately following a 22 cal/cm^2, 30 per cent surface area burn in the dog indicate that a 13 per cent decrease in red cell mass occurs, at least half of which can be attributed to direct destruction of erythrocytes and changes in osmotic fragility. The results of these experiments indicate that while there is a physiologic basis for whole blood therapy following burn, the more immediate requirement is plasma volume replacement. (auth)

4394 ORO-177

Tennessee. Univ., Knoxville. Agricultural Research Lab.

SEMI-ANNUAL PROGRESS REPORT FOR JANUARY 1, 1958 TO JUNE 30, 1958. 42p. Contract AT-40-1-GEN-242. $1.25(OTS).

The influence of alkaline earth metals on the distribution and excretion of strontium was studied in rats, sheep, and dairy cattle. The effects of dietary phosphorus and high levels of vitamin D on strontium distribution was observed. The influence of diuretics on potassium and cesium excretion was studied in sheep. Conventional and radiochemical procedures were used in studies of mineral metabolism in farm animals. Tracer studies are reported on copper-magnesium interrelationships in sheep; the calcium balance in sheep, swine, and steers as affected by stilbestrol, magnesium, ether extract, and zinc; and the relation of certain blood plasma constituents to milk in the dairy cow. Studies of the effects of radiation on reproduction were continued in cattle, swine, and rats. Standard psychological tests were applied to pre- and post-natally irradiated rats in an effort to assess the effects of radiation on various behavior characteristics. An effort is being made to develop similar techniques applicable to farm animals. Clinical, hematologic, and opthalmologic examinations were continued on burros exposed to fission weapon neutron-gamma irradiation. One burro was exposed to gamma-neutron radiation from a critical assembly in order to provide blood for sodium activation analysis. Levels were compared with human values due to accidental exposure. Preliminary studies were initiated to study the role of water in the radiosensitivity of dormant seeds. The program of seed and plant irradiation was continued with the irradiation of 25 samples. (For preceding period see ORO-174.) (C.H.)

4395 AEC-tr-3524

STUDIES ON THE PHAGE MULTIPLICATION IN INDUCED LYSOGENIC BACTERIA. II. EFFECTS OF VISIBLE LIGHT ON THE ULTRAVIOLET INDUCTION OF E. COLI, K-12 (λ). Kunisuke Miki. Translated for Oak Ridge National Lab. from Nippon Saikingaku Zasshi 11, 803-12(1956). 30p.

Results are reported from a study on the effect of visible light rays on the ultraviolet induction of phage multiplication in E. coli. Photoreactivation effects during the latent period and at various stages of phage multiplication were studied. The influence of various experimental conditions on the survival ratio of bacteriophage after exposure to ultraviolet light was also studied. (C.H.)

4396 CEA-tr-A203

DOSIMÉTRIE DES NEUTRONS. (Neutron Dosimetry.) B. Hess. Translated by P. Monnard from Z. angew. Phys. 5, 297-302(1953). 18p.

This paper was previously abstracted from the original language and appears in NSA, Vol. 7, as abstract No. 6566.

4397 CEA-tr-A476

LE RADIOSTRONTIUM EN DERMATOLOGIE. (Radiostrontium in Dermatology.) Translated from Atompraxis 3, 110-12(1957). 8p.

The use of disks of Sr^{90} for dermatological treatments is discussed. The method for the manipulation and storage of the disks and the protective measures taken in their use are described. (J.S.R.)

4398

BRONCHOGENIC CARCINOMA FROM RADIOACTIVE CERIUM FLUORIDE. Herman Cember, Joseph A. Watson, and Albert A. Spritzer (Univ. of Pittsburgh). A.M.A. Arch. Ind. Health 19, 14-23(1959) Jan.

Rats were exposed, by intratracheal insufflation, to radioactive CeF_3 at dose levels of 0, 5, 15, 25, and 50 μc. Bronchogenic carcinoma was observed in all groups of experimental rats. The smallest tumorgenic dose was 2400 rad. Extrapolation of the results to airborne Ce^{144} suggests that the maximum permissible atmospheric concentration of this isotope is set too high, and that consideration should be given to a more conservative figure. (auth)

4399

TRANSFER OF DONOR IMMUNOLOGICAL REACTIVITY TO X-IRRADIATED F_1 HYBRID MICE BY INJECTED PARENTAL BONE MARROW. L. J. Cole, R. M. Garver, and M. E. Ellis (U. S. Naval Radiological Defense Lab., San Francisco). Am. J. Physiol. 196, 100-4(1959) Jan.

Mice of the $(LxA)F_1$ strain were exposed to an LD_{100} dose of x rays and injected with bone marrow cell suspensions from A-strain mice. Excellent protection against death was observed during the first 3 weeks, followed by secondary homologous deaths during the ensuing weeks. When A-strain spleen cells were injected, together with A-strain bone marrow, then protective effect was annulled. When A-spleen cells were injected together with LAF_1 bone marrow cells into irradiated LAF_1 mice, again no protection was observed. However, injected LAF_1 spleen cells did not influence adversely the course of protection of x-irradiated A-strain mice by injected A-bone marrow. The findings formed the basis for an experimental test system for detecting the presence of A-lymphoid cells in the tissues of irradiated LAF_1 mice which had been injected with A-bone marrow. The data indicate that the spleen and thymus of LAF_1 mice 21 days after irradiation and injection of A-marrow contain A-lymphoid cells which when injected, in turn, into irradiated LAF_1 mice treated with LAF_1 marrow, annuls the protective effect of the injected marrow. It is concluded that a reaction of an immunological nature of the injected bone marrow cells, or their progeny, against the host tissues, contributes to the phenomenon of the late deaths. The significance of these results with respect to the problem of homologous disease in lethally x-irradiated mice treated with homologous bone marrow is discussed. (auth)

4400

APPLICATION OF AUTORADIOGRAPHY TO THE KINETIC STUDY OF THE SELECTIVE FIXATION OF A MEDICINAL SUBSTANCE. Carl G. Schmiterlöw and Yves Cohen. Ann. pharm. franc. 15, 227-34(1957) Apr. (In French)

Autoradiography of sections of 20 μ of frozen whole mice allows the topographical distribution of a radioactive substance in all the organs to be followed instantaneously. This method applied to an antiepileptic, N-benzyl-β-chloropropionamide, injected into a vein, showed that for such a substance whose action on the central nervous system is of long duration, C^{14} fixation in the brain was immediate but transient. For a substance which is active through the digestive system, there was a hepatic concentration and biliary excretion of C^{14} leading to the assumption of an enterohepatic cycle. C^{14} elimination took place in the last resort by the kidney for liposoluble substances. (auth)

4401

CELLULAR RADIOBIOLOGY. Thomas H. Wood (Univ. of Pennsylvania, Philadelphia). Ann. Rev. Nuclear Sci. 8, 343-86(1958).

A review is presented of those papers published during 1957 that deal with the effects of ionizing and ultraviolet radiations on simple biological systems. Topics discussed include models for primary radiation damage, factors influencing radiation response, effects of radiations, and aspects of cellular radiobiology. (W.D.M.)

4402

INFORMATION THEORY IN RADIOBIOLOGY. Henry Quastler (Brookhaven National Lab., Upton, N. Y.). Ann Rev. Nuclear Sci. 8, 387-400(1958).

The early stages of radiation reactions occur in small regions of molecular or macromolecular dimensions. The problem is how such local effects are amplified into disturbances of entities which are many orders of magnitude larger. This is a problem of relating malfunction of a system to perturbations of its components. One aspect of this problem is that of relating the probability of system malfunction to some measure of component perturbation. Relations of this type constitute one of the major concerns of information theory. (W.D.M.)

4403

INDUCTION OF SPORES OF LYSOGENIC BACILLUS MEGATHERIUM BY X-RAYS. Carl R. Woese (Yale Univ., New Haven). Arch. Biochem. Biophys. 79, 55-66 (1959) Jan.

Induction of phage synthesis by x irradiation of spores of lysogenic bacilli is reported. Comparisons between induction in the vegetative state and spore state, inducible and noninducible lysogenic systems, and effect of medium on induction are reported and discussed. (auth)

4404

THE EFFECTS OF RANGE-RESTRICTED ELECTRONS ON INTRACELLULAR YEAST CATALASE. John W. Preiss (Yale Univ., New Haven). Arch. Biochem. Biophys. 79, 261-8(1959) Jan.

Partial cell irradiation of intracellular yeast catalase with low-energy electrons was carried out. The enzyme activity could be increased when the bombarding electrons did not reach the region of the cell containing the enzyme. This region has its outer bound at least 2000 A deep in the cell, which is 1500 A deeper than the locus of invertase. The increase in activity caused by ionizing radiation is due to an effect on a structure near the cell surface, which is very probably within the cell wall. (auth)

4405

ANAEROBIC IRRADIATION OF ALCOHOL DEHYDROGENASE, ALDOLASE AND RIBONUCLEASE. Roger J. Romani and A. L. Tappel (Univ. of California, Davis). Arch. Biochem. Biophys. 79, 323-9(1959) Jan.

Alcohol dehydrogenase, aldolase, and ribonuclease have been irradiated under anaerobic conditions, and the inactivation rates, sulfhydryl losses, effect of sulfhydryl reductants, and ionic yields are reported. On the basis of these experiments it would appear that anaerobic irradiation inactivation of enzymes results from a nonspecific protein denaturation. Complete enzymic inactivation is closely associated with the formation of characteristic irradiation odors. (auth)

4406

LIMITATIONS OF CHELATING AGENTS FOR THE TREATMENT OF ACUTE RADIOSTRONTIUM POISONING. Jack Schubert (Argonne National Lab., Lemont, Ill.). Atompraxis 4, 393-7(1958).

The possibilities for promoting the excretion of radiostrontium and minimizing its deposition in the body are discussed. Calculations based on mass action equations and confirmed by existing experimental data lead to the following conclusions. Chelating agents such as ethylenediaminetetraacetic acid (EDTA) and similar polyamino chelating agents are impractical. They could only be useful if the binding affinity for Sr was at least 10^3 to 10^4 times stronger than that for Ca. Unfortunately, these and other chelating agents bind Ca as strongly or more than Sr. Chelating or complexing agents, A, which bind Sr with a formation constant, $K_{SrA} \cong 10^3$, are partially effective providing that $K_{CaA} \leq 10^3$ and that the agent is made available when the concentration of circulating Sr is high. When the binding affinity of a ligand for Sr is 10 or less, it is not an effective agent even when the corresponding binding affinity for calcium is nil. A chelating agent which is absolutely specific for Sr and completely unreactive with Ca, i.e., $K_{CaA} = 0$, is not particularly superior to a nonspecific agent insofar as circulating Sr is concerned. Thus, there is no especial difference in the effectiveness between citrate, Cit, where $K_{SrCit}/K_{CaCit} = 0.5$ and $K_{SrCit} = 700$, and a hypothetical ligand, A, where $K_{SrA}/K_{CaA} = \infty$ and $K_{SrA} = 700$. However, for oral treatment where calcium levels in the gut can be far higher than in the blood, then, all things being equal, a complexing agent which does not bind Ca could be far superior to a nonspecific agent. Positive possibilities for promoting Sr excretion following acute exposures are discussed and the inherent limitations of each are described. (auth)

4407

RADIATION SUCCULENCE. R. Biebl (Univ. of Vienna). Atompraxis 4, 411-16(1958). (In German)

Chronic radiation with gamma rays of Co^{60} as well as single-dose x radiation in the first days of germination causes, from a certain dosage onwards, a succulence of the leaves in addition to various other morphological changes. The enlargement of the epidermis cells and decrease in the number of stomata per unit area connected with this, as well as the loosening of the leaf nervation, are characteristics which, from a purely morphological point of view, place "radiation succulence" closer to "salt succulence" than to "dry succulence." Possible connections are pointed out between the number of stomata and the increase in ascorbic-acid content in the leaves which were observed following radiation. (auth)

4408

THE BEHAVIOR OF STRONTIUM-90 IN SOILS AND PLANTS AND AGRICULTURAL PRECAUTIONS FOR LESSENING THE STRONTIUM-90 CONTAMINATION OF FOOD. F. Scheffer and F. Ludwieg (Univ. of Göttingen, Ger.). Atompraxis 4, 416-19(1958). (In German)

The development of dirty atom bombs (hydrogen bombs with a uranium mantle) and the resultant high radioactive fall-out have made the strontium-90 contamination of foodstuffs a serious problem for humanity. The literature of recent years is used to survey the behavior of strontium-90 in plants and soil, and to discuss agricultural measures which could be taken to lessen the contamination of foodstuffs in case of atomic warfare. (auth)

4409

THE INFLUENCE OF CORTISONE ON THE TERATOGENIC ACTIVITY OF X RADIATION. D. H. M. Woollam, J. W. Millen, and J. A. F. Fozzard (Univ. of Cambridge, Eng.). Brit. J. Radiol. 32, 47-8(1959) Jan.

Three groups of 12 pregnant rats were used in the experiment. Animals in Groups 1 and 2 received 258 r of x radiation on Day 11 of pregnancy. Animals in Groups 2 and 3 received 20 mg of cortisone acetate on Days 9 to 12 of pregnancy. The young of dams in Group 3 showed no deformities. 5.2 per cent of the young from Group 1 and 18.8 per cent of the young from Group 2 showed malformations of the eye ranging from coloboma to anophthalmia. The findings indicate that cortisone exerts a potentiating effect on the teratogenic action of x radiation. (auth)

4410

LONG TERM EFFECTS OF DEUTERON IRRADIATION OF THE RAT PITUITARY. Donald C. Van Dyke, Miriam E. Simpson, Alexei A. Koneff, and Cornelius A. Tobias (Univ. of California, Berkeley). Endocrinology 64, 240-57(1959) Feb.

An investigation was made of the long-term effects of low radiation doses to the rat pituitary using a high-energy deuteron beam. The endocrine changes became increasingly more prominent with increasing dosage and with time. Data are presented on the effects of radiation on pituitary structure, endocrine changes in organs dependent on pituitary secretion, and incidence of adenomata following irradiation. (C.H.)

4411

THE EFFECT OF 200 R OF X-RAYS ON THE RATE OF SPERMATOGENESIS AND SPERMIOGENESIS IN THE MOUSE. R. G. Edwards and J. L. Sirlin (Inst. of Animal Genetics, Edinburgh). Exptl. Cell Research 15, 522-8(1958) Dec.

Doses of 200 r x rays to the testes of mice previously injected with a adenine-8-C^{14} did not delay the first appearance of or the increase in number of labelled spermatozoa in the ejaculate. From this evidence it is concluded that after this dose (a) spermatogenesis proceeds at the normal speed, (b) there is no damage to the vasa, at least as far as the progression of spermatozoa is concerned, and (c) for the progression of spermatozoa there is no vis a tergo from the seminiferous epithelium or the epididymis. (auth)

4412

ALPHA IRRADIATION OF PARTS OF SINGLE CELLS IN TISSUE CULTURES. I. TECHNIQUES. II. DOSIMETRY. T. R. Munro (Christie Hospital and Holt

Radium Inst., Manchester, Eng.). Exptl. Cell Research 15, 529-50(1958) Dec.

Techniques are described for the following: growing chick heart fibroblasts under conditions which permit single cells to be subjected to micromanipulation; making tungsten micro-needles; depositing polonium upon their tips; and sealing this in position by an electro-deposited layer of chromium. The micro-needles serve as sources of alpha particles which have a well-defined, measurable range of 20 to 35 microns, depending upon the thickness of the chromium. They can be used to irradiate parts of single cells in tissue cultures. (auth)

4413

THE INFLUENCE OF IONIZING RADIATIONS ON THE PENETRATION OF SODIUM INTO THE CENTRAL NERVOUS SYSTEM. Raymond G. Rose (Univ. of Texas, Houston). Intern. J. Appl. Radiation and Isotopes 4, 50-7(1958) Dec.

High doses of irradiation are required to produce definite morphological changes in the central nervous system. The present experiment was conducted to see if functional derangements occur after comparatively small amounts of ionizing radiations. Tracer studies with intravenously injected radioactive sodium were performed on rabbits to determine the rate and degree of sodium penetration into the cerebro-spinal fluid and brain. Other groups of rabbits were given large doses of Na^{24} or 100 to 1500 r of total-body x irradiation, followed by tracer doses of Na^{24} at varying intervals, to study the possible effects of such irradiation. The data obtained showed an accelerated penetration of sodium into the CNS under these conditions, as well as an apparent increase in radiosodium content in the CNS when compared with the control group. Histological changes were minimal at the highest dosage levels employed. The significance and possible applications of these findings are discussed. (auth)

4414

THE CRITERION OF MORTALITY AND ITS YIELD OF INFORMATION IN EXPERIMENTAL RADIOBIOLOGY. D. J. Mewissen (Univ. of Liège). Intern. J. Appl. Radiation and Isotopes 4, 58-63(1958) Dec. (In French)

Mortality is a quantal response with a definite frequency distribution. Probit analysis is the appropriate method providing a maximum amount of information from the lethal quantal response. It should be used whenever a numerical assessment is required in studies of radiation injury. The method using a 100 per cent lethal dose for controls is of limited value. However, it is simple and economical. A frequency ratio method may be used instead of probit analysis. Mortality (or survival) proportions provide a maximum amount of information in the vicinity of the median effective dose. In screening experiments, the sequential test of mortality yields early data with the fewest possible animals. (auth)

4415

EXPERIMENTS IN THE PREVENTION AND TREATMENT OF RADIATION SICKNESS IN CHICKS. M. L. Beaumariage (Univ. of Liège). Intern. J. Appl. Radiation and Isotopes 4, 69-83(1958) Dec. (In French)

The prophylaxis and cure of radiation sickness in chicks were studied following exposure to a total dose of 2000 r x radiation. Most of the deaths occurred within 48 hours. Two phases of lethality, one rapid and the other delayed, were observed. The protective effects of a number of chemicals were tested. A slight protective effect was demonstrated for sodium diethyldithiocarbamate and tryptamine. Serious functional and metabolic disturbances were manifest quickly. Of a number of antihistamines tried, only Neoantergan was effective when administered prophylactically. (C.H.)

4416

CONCERNING THE MECHANISM OF ACTION OF PARATHYROID HORMONE. II. METABOLIC EFFECTS. G. R. Martin, H. E. Firschein, B. J. Mulryan and W. F. Neuman (Rochester Univ., New York). J. Am. Chem. Soc. 80, 6201-4(1958) Dec. 5.

The effects of varying parathyroid status on arteriovenous differences of pyruvate, lactate, and citrate were studied in several tissues in the dog. Bone was shown to be an important source of circulating citrate and this citrate production by bone was dependent upon parathyroid hormone levels. Citrate uptake was shown only by the kidney, but a hormonal effect on this process, if it occurs, was not clearly demonstrated. Interesting trends suggesting a hormonally stimulated ultilization of pyruvate and production of lactate and citrate were observed in various tissues in addition to bone and kidney. These findings are discussed in terms of the mechanism of action of parathyroid hormone. (auth)

4417

MUTATIONS IN BACTERIA. F. Kaudewitz (Max-Planck-Institut für Virusforschung, Tübingen, Ger.). Naturwissenschaften 45, 529-32(1958). (In German)

A survey is presented on the use of bacteria in the study of induced mutation. The selection system in bacteria genetics, induced mutability, and delayed mutation origin and non-stable condition of the cell according to the ending of the mutating effect are discussed. 23 references. (J.S.R.)

4418

A COENZYME CONTAINING PSEUDOVITAMIN B_{12}. H. A. Barker, H. Weissbach, and R. D. Smyth (Univ. of California, Berkeley). Proc. Natl. Acad. Sci. U. S. 44, 1093-7(1958) Nov.

The isolation is reported of a coenzyme form of pseudovitamin B_{12} which is required for the decomposition of glutamate by particle-free extracts of Clostridium tetranomorphum. The coenzyme is involved in the rearrangement of the carbon of glutamate to form a branched chain amino acid, β-methylaspartate. (C.H.)

4419

SERIAL CELL-FREE PASSAGE OF A RADIATION-ACTIVATED MOUSE LEUKEMIA AGENT. Ludwik Gross (Veterans Administration Hospital, Bronx, New York). Proc. Soc. Exptl. Biol. Med. 100, 102-5(1959) Jan.

A filterable leukemic agent designated "virus X" recovered from a C3H female in which leukemia was induced by x irradiation was passed serially through 4 consecutive cell-free inoculations of suckling C3H mice. Of 40 mice inoculated, 26 developed leukemia at ages varying from 3 to 11 months. Inactivated rabbit and guinea pig serum, prepared with agent X filtrates, only partially neutralized passage A leukemic agent; passage A immune rabbit serum had a distinct, though not complete, neutralization effect on the passage A agent. (auth)

4420

URINARY EXCRETION OF BETA AMINOISOBUTYRIC ACID (BAIBA) IN IRRADIATED HUMAN BEINGS. J. R. Rubini, E. P. Cronkite, et al. (Brookhaven National Lab., Upton, N. Y.). Proc. Soc. Exptl. Biol. Med. 100, 130-3(1959) Jan.

Beta-aminoisobutyric acid (BAIBA) was found in increased amounts in urine from a group of human beings accidentally exposed to serious radiation. BAIBA levels excreted appear related to the estimated doses received. The implications of BAIBA excretion as related to DNA metabolism and irradiation-induced aplasia are discussed. (auth)

4421

OSTEOMYELITIS OF THE MANDIBLE FOLLOWING IRRADIATION. Elmer Ng, Frank W. Chambers, Jr., et al. (Univ. of California, San Francisco). Radiology 72, 68-74(1959) Jan.

A generally applicable method is described for the experimental irradiation of the mandible of the adult dog. Gingival ulceration and osteomyelitis of the underlying mandible occurred following exposure to irradiation of 4,000 r or more, under the conditions of this experiment. Removal of the teeth prior to irradiation of the mandible significantly decreased the incidence of osteomyelitis. Osteomyelitis was not observed in the absence of ulceration of the overlying gingiva. Bone necrosis without osteomyelitis was not observed with the dosage and time range studied. (auth)

4422

THE NATURE OF THE EFFECT OF ACTH AND CORTISONE ON TUMOR GROWTH IN IRRADIATED ANIMALS. Henry P. Plenk, Roger Fuson, and Fred M. Sorensen (St. Marks Hospital and Univ. of Utah, Salt Lake City). Radiology 72, 75-80(1959) Jan.

Two mammary carcinomas and one neuroblastoma were transplanted into the anterior chamber of the eye in young mice of susceptible strains. A single administration of 3,000 r/air to the orbit on the fourth post-transplant day produced survivals at seventy days of 23 to 55 per cent of the mice. Most unirradiated control animals were dead by the fifty-sixth day. The administration of ACTH or of cortisone in association with irradiation for at least fourteen days after transplantation resulted in an increase in the seventy-day-survival rate in both strains of mice with all three tumors used in this experiment. Cortisone was more effective than ACTH in two tumors. ACTH was more effective than cortisone in one tumor. In the only tumor which metastasizes regularly to the cervical lymph nodes, ACTH and cortisone when administered to irradiated mice produced a significant decrease in the incidence of metastases. Administration of ACTH and cortisone produced no significant inhibitory or enhancing effect on tumor growth in the anterior chamber of the eye or on the incidence of metastases in unirradiated animals. ACTH and cortisone enhanced the inhibitory effect of x rays on tumor growth without ill effects on the tumor-bearing animal. It is believed that the influence of these hormones on the prolongation of life and on the decreased incidence of metastases in irradiated tumor carriers is due to a modification of the irradiation effect and not to direct action on tumor growth. (auth)

4423

ZINC-65 IN FOODS AND PEOPLE. R. W. Perkins and J. M. Nielsen (General Electric Co., Richland, Wash.). Science 129, 94-5(1959) Jan. 9.

Disposal of trace amounts of Zn^{65} is made in the Columbia River via Hanford reactor effluent water. The subsequent utilization of river water for irrigation permits the concentration of this radioisotope in farm produce and its eventual deposition in man. The Zn^{65} in irrigation water, in farm produce, and in individuals utilizing these materials has been measured. (auth)

4424

MUTATION IN THE PROTOZOAN PARAMECIUM MULTIMICRONUCLEATUM AS A RESULT OF X-IRRADIATION. Ralph Wichterman (Temple Univ. and Marine Biological Lab., Woods Hole, Mass.). Science 129, 207-8(1959) Jan. 23.

Mutations have been produced in the protozoan Paramecium multimicronucleatum by repeatedly exposing clonal cultures of the animals to large dosages of x irradiation. The descendants of x-rayed survivors showed the following changes, which persisted in culture: destruction and loss of all micronuclei, decrease in vitality and reproductive rate, and increase in x-radiation sensitivity, monstrosity, and reduced body size. (auth)

4425

THE EFFECT OF FLUOROCHROMES ON THE SENSITIVITY OF CELLS TO RADIATION. E. Ia. Graevskii and E. G. Zinov'eva (A. N. Severtsov Inst. of Animal Morphology, Academy of Science, USSR). Soviet Phys. (Doklady) 3, 206-8(1958) Jan.-Feb.

Experiments were made on a single culture of Paramecium caudatum using Aleksandrov's method in Lozina-Lozinski's medium in darkness at 22°C to determine the effect of hematoporphyrin, trypaflavine, and fluorescein on the radiosensitivity of the cells. The cultures were exposed to 100 kr of x rays. The results showed that the dose caused a noticeable reduction in the rate of division of the infusoria on the first day after treatment, but on the second day the rate of division had returned to normal. When direct illumination was excluded, the dyes by themselves caused no harmful effects. (J.S.R.)

4426

DEPENDENCE OF THE SURVIVAL OF PARAMECIUM CAUDATUM ON THEIR NUMBER IN UNIT VOLUME ON IRRADIATION BY X-RAYS. E. G. Zinov'eva (A. N. Severtsova Inst. of Animal Morphology, Academy of Sciences, USSR). Soviet Phys. (Doklady) 3, 209-12 (1958) Jan.-Feb.

The effect of the number per unit volume on the survival of paramecia after x irradiation with 50, 100, 300, and 500 kr was studied in water and Lozina-Lozinski medium. The results showed that with certain concentrations of paramecia almost 100% survival can be achieved in the range of doses studied. The percentage survival can be expressed by $P = 100 - 44.6 \log v(2.5D - 3000)$, where v is the volume of water per paramecium and D is the dose in kr. The equation is inapplicable to small doses and small numbers of organisms. (J.S.R.)

4427

USE OF ISOTOPES IN PHARMACODYNAMICS. Yves Cohen (Centre d'Etudes Nucleaires, Saclay, France). Therapie 12, 708-36(1957). (In French)

A brief survey is given of the methods for the synthesis of labeled medicines. The pharmacodynamic and chemotherapeutic studies made with labeled drugs are discussed and analyzed. The investigations were made along three courses: study of the distribution of drugs

in the organism, study of their degradation and elimination, and study of the mechanisms of their effects. 68 references. (J.S.R.)

4428

INVESTIGATION ON THE INTERPRETATION OF THE RADIATION-INDUCED GLYCOLYSIS INHIBITION IN YOSHIDA-ASCITES TUMOR CELLS. H. Maass, G. H. Rathgen, et al. (Universitäts-Frauenklinik Hamburg-Eppendorf). Z. Naturforsch. 13b, 735-41(1958) Nov. (In German)

A decrease of the stationary concentration in diphosphopyridine nucleotide was established as the reason for the radiation-induced glycolysis inhibition described in a previous paper (Z. Krebsforsch. 61, 666 (1957)). (tr-auth)

4429

THE DOSE DEPENDENCE OF THE EFFECT OF A WHOLE-BODY IRRADIATION ON THE ELECTROLYTIC AND WATER CONTENT OF SPLEEN. H. Breuer, R. Knuppen, and H. K. Parchwitz (Chirurgischen Universitäts-Klinik und Poliklinik, Bonn). Z. Naturforsch. 13b, 741-3(1958) Nov. (In German)

The potassium, sodium, chloride, and water content of the spleen of adult male rats was investigated after whole-body irradiation. The dose given lay in the range of the 3.5-day effect. There was a decrease of the potassium content and an increase of the sodium content. The changes in the range of 500 to 12,000 r were independent of the dose. The water content of the spleen decreased after the irradiation, while the chloride content was not significantly altered. The results were discussed with respect to the mechanism of the radiation damage after whole-body irradiation. (tr-auth)

4430

SUMMARIES OF PAPERS PRESENTED AT THE CONFERENCE ON THE REMOTE CONSEQUENCES OF INJURIES CAUSED BY THE ACTION OF IONIZING RADIATION, COMMITTEE ON MEDICAL RADIOLOGY, MINISTRY OF HEALTH, USSR. F. G. Kortkov, A. V. Lebedinskii, and A. I. Ignatev, eds. New York, Consultants Bureau, Inc., 1957. 75p. $10.00.

Summaries are presented of 22 papers presented at this conference. Results are reported from a series of studies on the long-term pathological effects resulting from the exposure of animals to external radiation and from radioactive substances retained in the body. It was established that generally accepted diagnostic tests do not always reflect the development of a pathological process induced by small doses of radiation. Rapid aging of the organisms, a shortening of the life-span of the injured animals, and sharp changes of the reactivity of the injured organisms to external influences were noted. In a large number of cases the presence of radioactive substances lead to the development of malignant tumors. Injuries caused by small doses were found to diminish the viability of the progeny. The need for further studies as an aid in the development of chemicals and procedures for the prophylaxis and therapy of radiation injuries is stressed. (C.H.)

4431

BASIC FOUNDATIONS OF ISOTOPE TECHNIQUE FOR TECHNICIANS. Willard C. Smullen, ed. Springfield, Ill., Charles C. Thomas, 1956. 176p.

A comprehensive compilation is presented of fundamental material for the use of beginners in isotope procedures. References at the end of each chapter indicate the many books and articles available for the advanced student or therapist. Equipment and procedures are illustrated photographically. (C.H.)

4432

ORGANIC PEROXIDES IN RADIOBIOLOGY. (Les Peroxydes Organiques en Radiobiologie). R. Latarjet, et al. New York, Pergamon Press, 1958. 157p.

The papers given at the Colloquium on Organic Peroxides Formed by Radiations and Their Role in Radiobiology, held in Paris on Jan. 9-10, 1957, are presented. The topics discussed include the following: the peroxides in the area of fatty substances from a chemical point of view; radiochemical peroxidation of cumene, oxidation degradation of polystyrolene in a diluted chloroform solution by irradiation in air; effects of oxygen on the degradation of DNA by ionizing radiations; effects of oxygen and the radiation induced formation of hydroperoxides from nucleic acids and related compounds; formation of hydroperoxides from certain amino acids and peptides in aqueous solutions by irradiation in the presence of oxygen; toxicity and chemistry of autoöxidized squalene and linoleic acid and of simple peroxides in relation to toxicity of radiation; effect of organic peroxides on a factor-transforming pneumococci; presumptive indication of radiation-produced peroxide as shown by its genetic effects in Drosophila; activation of the oxygen and oxidizing power of ascorbic acid; partial inactivation of bacteriophages; the influence of oxygen on the radiosensitivity of cells and tissues; modification of the oxygen effect by gases; radioprotective activity of glycerine in bacteria; chain reaction in the aqueous phase and the "oxygen effect"; and a mechanism for the oxygen effect. (J.S.R.)

CHEMISTRY

General

4433 AECU-3919

Michigan. Univ., Ann Arbor.

ALPHA FERRIC OXIDE: LOW TEMPERATURE HEAT CAPACITY AND THERMODYNAMIC FUNCTIONS. Fredrick Grønvold and Edgar F. Westrum, Jr. 1957. 15p. $3.30(ph OTS); $2.40(mf OTS).

The heat capacity of synthetic alpha ferric oxide was determined at 5 to 350°K. The experimental technique is described, and the heat capacity and molal thermodyamic functions are tabulated. The heat capacity vs. temperature is shown graphically. (J.R.D.)

4434 AFOSR-TN-58-1036

Hebrew Univ., Jerusalem.

THE OPTICAL SPECTRUM OF Co^{2+} IN THE CUBIC CRYSTALLINE FIELD OF CaF_2. Technical Note No. 4. R. Stahl-Brada and W. Low. July 1958. 25p. Contract AF61(052)-59. (AD-206485).

The optical spectrum of Co^{2+} in CaF_2 is analyzed. Absorption bands are found at 3, 1.5, and 0.55 μ. These bands show fine structure. In addition, there are weak and narrower bands at 19,220, 19,580, 20,450, 21,750, 22,000, and 25,750 cm^{-1} and intense lines at 44,250 and 48,200 cm^{-1}. The spectrum is interpreted to arise from transitions from the orbital singlet to various Stark levels split by spin-orbit interaction, and yields values of $Dq = 340 \pm 10$ cm^{-1}, $E(P) = 14,000 \pm 100$ cm^{-1}, and $E(G) = 16,250 \pm 100$ cm^{-1}. The spectrum of Co^{2+} in the eight coördinated cubic symmetry is compared with Co^{2+} in octahedral and tetrahedral symmetry as well as with Cr^{3+} in octahedral symmetry. (auth)

4435 CEA-795

France. Commissariat à l'Énergie Atomique, Paris.
SYNTHÈSE D'ÉTHANOL ^{14}C-1. (Synthesis of Ethanol ^{14}C-1.) R. E. Wolff and L. Pichat. Feb. 4, 1958. 10p.

The direct reduction by $LiAlH_4$ of a suspension of anhydrous sodium acetate in tetrahydrofurfuryloxy-tetrahydropyran is described. This study has shown that the ethanol thus obtained is impure and that the yields are erratic. On the contrary the reduction of acetyl chloride 1-C^{14} by $LiAlH_4$ in "diethyl carbitol" leads to ethanol-1-C^{14} of satisfactory purity with a yield of about 71 percent. (auth)

4436 CEA-796

France. Commissariat à l'Énergie Atomique, Paris.
BIBLIOGRAPHIE SUR LE PLUTONIUM ET SES COMPOSÉS. (Bibliography on Plutonium and its Compounds.) J. Dirian and J. Choquet. Jan. 1958. 103p.

A bibliography is presented which contains 937 references to scientific journals and reports of the USAEC, AECL, and the UKAEA. The following topics, with relation to Pu, are covered: preparation, extraction, purification, determination, analysis, physical properties, nuclear properties and isotopes, chemical properties, metallurgy, alloys, and principal compounds. (T.R.H.)

4437 HW-58406

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
ELECTROANALYTICAL STUDIES OF THE TUNGSTEN HEMIPENTOXIDE ELECTRODE. Harry Freund. Dec. 4, 1958. 23p. Contract W-31-109-Eng-52. $4.80 (ph OTS); $2.70(mf OTS).

The objective of this investigation was the application of a tungsten hemipentoxide electrode to controlled potential coulometry. The method used for preparing the electrodes is described. Results of the investigation indicate that the tungsten hemipentoxide electrode, despite its high oxygen overvoltage, can be applied successfully to coulometry at high positive potentials. (W.L.H.)

4438 LA-193

Los Alamos Scientific Lab., N. Mex.
LARGE-SCALE PREPARATION OF THE ANHYDROUS FLUORIDES OF PLUTONIUM. S. E. Bakes, J. Crom, C. S. Garner, I. B. Johns, and G. H. Moulton. Dec. 20, 1944. Decl. Dec. 8, 1958. 20p. $4.80(ph OTS); $2.70 (mf OTS).

The anhydrous fluorides of plutonium were prepared by the reaction of anhydrous hydrogen fluoride with plutonyl nitrate, trivalent plutonium oxalate, and plutonium dioxide. The fluorides of uranium, thorium, and cerium were prepared by some of these reactions also. The reaction of hydrogen fluoride on the oxide was chosen for the large-scale preparation of plutonium tetrafluoride. The equilibrium constant for this reaction was determined at 400 and 600°C. To obtain the most rapid and complete reaction the effects of the following variables have been studied: temperature of ignition of the oxide; temperature for reaction with HF; rate of rise of temperature; rate of flow of gas mixture; depth of oxide layer; dryness of the gas mixture; and composition of the gas mixture. The best conditions for conversion on the 8-g-to-25-g scale are described. The conversion of fluoride back to oxide is also described. (auth)

4439 NAA-SR-2686

Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.
SPECTROPHOTOMETRIC DETERMINATIONS OF BERYLLIUM AND FLUORIDE USING CHROME AZUROL S. Louis Silverman and Mary E. Shideler. Dec. 1, 1958. 21p. Contract AT-11-1-GEN-8. $0.75(OTS).

Chrome Azurol S has been applied to the spectrophotometric determination of beryllium and fluoride. The colored beryllium–Chrome Azurol S complex is formed at pH 6.0 in the presence of a pyridine–hydrochloric acid buffer, which enhances the sensitivity of the dye to beryllium and increases the sensitivity of the metal–dye complex to fluoride. With the procedure described, from 1 to 30 μgm of fluoride per 50 ml volume can be determined to a precision of 1 μgm, and from 0.2 to 10 μgm of beryllium per 50 ml volume can be determined to a precision of 0.2 μgm. Studies were made on the variables of the system, on the interferences, and on an ion exchange method to separate uranium from beryllium. (auth)

4440 NBL-147

New Brunswick Lab., AEC, N. J.
SEMIANNUAL PROGRESS REPORT FOR THE PERIOD JANUARY 1958 THROUGH JUNE 1958. C. J. Rodden. Nov. 1958. 81p. $2.25(OTS).

A method is presented for the spectrophotometric determination of B in Zircaloy. The determination of trace quantities of bromine in uranium compounds using a spectrophotometer is presented. A fluorometric method for the determination of Al in Be metal is described. Two methods are presented for the determination of uranium with high precision. A thermogravimetric study was made of the composition of U_3O_8 from two different sources, one derived from the nitrate and one from the metal, heated between 300 and 1000°C. The method of preparation and the x-ray-diffraction pattern of a double thorium salt believed to be $NH_4ThF_5 \cdot H_2O$ are presented. An experimental investigation of the determination of uranium in various feed materials by x-ray fluorescence using the borax fusion method is described. A method for the determination of uranium ores or standard samples by counting the relative beta-gamma activity is described. The determination of U^{235} by neutron activation in quartz and teflon sample tubes is described. An extension of the method of isotope analysis of U^{235} by gamma scintillation spectrometry and pulse-height analysis has been made to uranium oxide containing concentrations of U^{235} greater than normal. A rapid method for the quantitative determination of trace amounts of silicon, manganese, and zinc in magnesium has been developed. A method for the spectrochemical analysis of beryllium metal is reported. (For preceding period see NBL-143.) (W.L.H.)

4441 NDA-39(Del.)

Nuclear Development Corp. of America, White Plains, N. Y.
PURIFICATION OF LITHIUM BY VACUUM DISTILLATION. (75-15). William Arbiter and Stanley Lazerus. June 14, 1957. Decl. with deletions Apr. 10, 1958. For [Oak Ridge National Lab]. Contract W-7405-eng-26, Subcontract 981. 21p. $4.80(ph OTS); $2.70(mf OTS).

A review of the steps leading to the development of the apparatus presently used for the vacuum distillation of lithium is presented. Limitations of the apparatus and difficulties encountered in its use are discussed. The results of a limited number of chemical analyses of the products of distillation runs are given. (auth)

4442 NP-7088

Polish Academy of Sciences. Inst. of Nuclear Research, Warsaw.
TRENNUNG DES URANS VON DEN BEGLEITMETALLEN VERMITTELS DER CARBONATMETHODE. (Separation

of Uranium from Associated Metals by the Carbonate Method.) L. Wodkiewicz. Oct. 1958. 5p.

A method of separating U from associated metals is described. It is based on the complex-forming ability of U with alkali metal carbonates and ammonium carbonate. By this method Fe, Al, Ti, Cr, V, Zn, Mn, and alkaline earths can be separated from U. After separation the U is determined colorimetrically by the peroxide method. The method is suitable for U ores containing from 1 to 0.01% U. (tr-auth)

4443 NP-7101

MSA Research Corp., Callery, Penna.

PROGRESS REPORT NO. 49 FOR OCTOBER AND NOVEMBER 1958. W. J. Posey, ed. Dec. 16, 1958. 35p. Contracts NObs-65426 and NObs-77023.

Repair of the loop was completed, and preliminary operations (debugging and calibrating) were made. Heat transfer runs with water at 2000 psia were conducted until the NaK system became plugged. Additional tests were made with stainless steel pipe specimens. The effects of low oxygen atmosphere, insulating techniques, and the protection afforded by protective coatings were investigated. These tests indicate that a 1% oxygen compartment atmosphere is ineffective in reducing corrosion, that insulated piping wetted with sea water will corrode piping more quickly than piping without insulation, and that commercially available high-temperature protective coatings provide limited protection to stainless materials exposed to chloride-bearing solutions. The present phase of work on fission product release during core meltdown was completed. Analytical techniques for detecting chloride at <100 ppb concentrations in water are being studied with particular application to high-pressure, high-temperature power reactor systems for submarines. (For preceding period see NP-6985.) (W.L.H.)

4444 NP-7186

Stanford Research Inst., Menlo Park, Calif.

HIGH TEMPERATURE SYNTHESES OF NEW, THERMALLY STABLE CHEMICAL COMPOUNDS. Quarterly Progress Report No. 11 (Report No. 6) [for] October 1–December 31, 1958. Russell C. Phillips, David L. Chamberlain, and F. Alan Ferguson. Jan. 6, 1959. 24p. SRI Project No. SU-2590. Contract AF33(616)-5940.

The organofluorine research was centered on the synthesis of 1,2-difluorotetrabromoethane, which will be pyrolyzed to obtain difluoracetylene. Attempts to add fluorine to tetrabromoethylene using lead tetrafluoride and pyridine difluoride, have not yet been successful. These efforts will be continued, and 2-fluoropyridine difluoride will also be prepared as a fluorine donor. A Vycor tube resistance furnace for pyrolysis reactions was assembled with a product collection system. The synthesis of thiophosphonitrilic (SPN) polymers and precursors will be attempted by pyrolysis of $SP(NH_3)_2$ at 1000°C or higher, by direct reaction of the elements at high temperature, or by starting with PN, P_3N_5 or P_4S_{10}. Although magnesium scandate spinel was not formed by sintering the oxides in preliminary experiments the technique was shown to be adequate for the synthesis of magnesium aluminate spinel. The melting point of scandia was found to be 2350°C ± 50. The identity of the boron suboxide, B_7O, was established unequivocally by x-ray powder diffraction analysis. The orthorhombic unit cell dimensions are: a = 8.20A, b = 5.35A, c = 5.13A. (auth)

4445 NP-7215

Illinois Inst. of Tech., Chicago. Armour Research Foundation.

INVESTIGATION OF GRAPHITE BODIES. Progress Report No. 1 for the Period October 1 to December 31, 1958. S. W. Bradstreet. Jan. 1, 1959. 10p. Project No. G-039. Contract AF33(616)-6143.

An initial investigation was made of furfuryl alcohol as a binder, and the apparatus being assembled for fabrication and measurement of multicrystalline graphite specimens is described. (auth)

4446 NP-7225

Amherst Coll., Mass.

THERMODYNAMIC PROPERTIES OF THE ELECTRICAL DOUBLE LAYER. SEARCH FOR SPECIFIC ADSORPTION OF CESIUM IONS IN THE ABSENCE OF SPECIFICALLY ADSORBED ANIONS. F. R. M. Deane, A. E. Higinbotham, and D. C. Grahame. Technical Report No. 7 (Second Series). Nov. 14, 1958. Includes translation by R. Parsons: ADSORPTION OF Cs^+ IONS ON A MERCURY ELECTRODE SURFACE. B. B. Damaskin, N. V. Nikolaeva-Fedorovich, and A. N. Frumkin. Doklady Akad. Nauk S.S.S.R. 121, 129-32 (1958). (NP-tr-204). 32p. Contract Nonr-2309(01).

Three lines of evidence are presented tending to show that the cesium ion is not specifically adsorbed on mercury in the absence of specifically adsorbed anions. The potential of the e.c. max. in solutions of cesium fluoride is found to be constant at a value of 0.475 ± 0.003 v relative to a normal calomel electrode. The behavior of the capacity of the double layer is normal in that it can be predicted almost quantitatively by a theory which assumes the absence of specific adsorption of both cations and anions and simple dependence of the capacity of the inner region upon the surface charge density, q, and not upon the concentration of the electrolyte. The slight dependence of the capacity of the inner region of the double layer upon the identity of the associated cation found by Damaskin, Nikolaeva-Fedorovich, and Frumkin is confirmed but is explained in a manner which does not require their postulate of specific adsorption of cesium ions on positively charged mercury. (auth)

4447 NYO-7741

New York Univ., New York.

TECHNICAL PROGRESS REPORT. Benson R. Sundheim. Oct. 9, 1958. 12p. Contract AT(30-1)-1938. $3.30(ph OTS); $2.40(mf OTS).

The absorption spectra obtained when eutectic mixtures of lithium and potassium chlorides or bromides serve as solvents and alkali halides or halogens serve as solutes are discussed. (W.L.H.)

4448 TID-3523

Technical Information Service Extension, AEC.

CHEMISTRY OF BORON AND BORON COMPOUNDS. A Literature Search. William E. Bost, comp. Jan. 1959. 27p. $0.75(OTS).

Included are 244 references from the AEC-held unclassified report literature on the chemistry (preparation, determination, and chemical properties and reactions) of boron and boron compounds. The references are divided into two parts: unpublished reports and reports published in journals. The arrangement of both parts is alpha-numeric by report number. (auth)

4449 UCRL-8421

California. Univ., Berkeley. Radiation Lab.

BIO-ORGANIC CHEMISTRY QUARTERLY REPORT

[FOR] MARCH, APRIL, MAY, 1958. June 27, 1958. 55p. Contract W-7405-eng-48. $1.50(OTS).

A study is currently being made of the incorporation of tritiated water by Chlorella cells suspended in various media and under conditions of light and dark. This work is part of a program to study the path of hydrogen in photosynthesis. A study is being made of the non-photosynthetic pathways of CO_2 fixation in three microorganisms, two algae and a fungus. Steady-state studies are reported on the carbon-reduction cycle in photosynthesis. Papaver somniferum (opium poppy) plants are being cultivated in the presence of radioactive CO_2 for the purpose of studying the path of carbon to the morphine alkaloids. The synthesis of 2-C-hydroxymethyl pentonic acids is described. The effect of D_2O on the metabolism of several labeled compounds by mice has been studied. Electron-spin resonance studies of irradiated choline chloride are presented. The isotope effect was studied in the decarbonylation of benzoylformic acid. An ionization chamber technique is described for determining the specific activity of any C^{14}-containing compound with a standard error of less than 1% or 40 disintegrations per minute, whichever is larger. Progress on the enzymic studies of the rat brain is reported. (For preceding period see UCRL-8204.) (W.L.H.)

4450 UCRL-5333

California. Univ., Livermore. Radiation Lab. PRELIMINARY STUDIES OF URANIUM AND ZIRCONIUM AS POTENTIAL GETTERS. R. McFarland. Oct. 1958. 8p. Contract W-7405-eng-48. $1.80(ph OTS); $1.80(mf OTS).

Uranium in the activated form is an excellent getter, and its action combined with the pumping action of the Veeco produced the lowest pressures observed. Moderately H_2-loaded U can be tolerated in vacuum systems at room temperature for the production of a vacuum of 10^{-9} mm of Hg or better. Heavily loaded U cannot. Heavily hydrogen-loaded Zr can be contained within an ultrahigh vacuum system at 10^{-9} mm of Hg or lower pressure providing that the loading operation itself does not leave loosely bound hydrogen on the surfaces within the vacuum system. (W.L.H.)

4451 WAPD-204

Westinghouse Electric Corp. Bettis Plant, Pittsburgh. THE TOTAL ASSAY OF HIGH PURITY NIOBIUM METAL BY DIFFERENTIAL SPECTROPHOTOMETRY. R. O. Backer, V. R. Wiederkehr, and G. W. Goward. Sept. 1958. 10p. Contract AT-11-1-GEN-14. $0.50 (OTS).

A method was developed to determine the total niobium content of high-purity niobium metal. Samples are dissolved in hydrofluoric and nitric acids and fumed with sulfuric acid. Niobium is determined by differential spectrophotometric measurement of the peroxyniobate complex formed in a mixture of phosphoric and sulfuric acids. The method as written covers a concentration range at 92.3 to 100.0% niobium. The relative standard deviation of the method is about ± 0.1%. (auth)

4452 AEC-tr-3507

PRODUCTION OF DEUTERIOBENZENE (BENZENE-D_6). A. Klit and A. Langseth. Translated by K. S. Bevis (Savannah River Lab.) from Z. physik. Chem. (Leipzig) A176, 65-80(1936). 17p.

A method for preparing benzene-d_6 based on the exchange between DCl and C_6H_6 is described. Deuterobenzene compounds containing 98% deuterium were prepared using $AlCl_3$ as a catalyst. The exchange was followed quantitatively, and the equilibrium constant for the reaction was calculated. The density and melting point for the pure material were calculated from observed values of the prepared deutero compounds. (J.R.D.)

4453 AERE-Lib/Trans-802(Papers 1&2)

PAPER I. DETERMINATION OF STABILITY CONSTANTS OF $Th(NO_3)_x^{4-x}$ IONS BY MEANS OF TRIBUTYL PHOSPHATE EXTRACTION. V. V. Fomin and E. P. Maiorova. Translated by S. Botcharsky (U.K.A.E.A. Atomic Energy Research Establishment) from Zhur. Neorg. Khim. 1, 1703-12(1956). PAPER 2. DETERMINATION OF STABILITY CONSTANTS $Th(NO_3)_j^{4-j}$ IONS. Ibid., 2749-52. 19p.

The distribution of nitric acid between an aqueous solution and TBP in benzene and the distribution of trace amounts of thorium between the aqueous solution of nitric acid and TBP in benzene were investigated. The nitric acid distribution was determined so that known conditions could be effected for the experiments to determine the composition and stability of thorium nitrate. To verify the constants previously established, experiments on extraction of weighable amounts of thorium from solutions of a given strength in equilibrium solutions were carried out. (J.R.D.)

4454 CEA-tr-R240

PROPRIÉTÉS COLLOÏDALES DU POLONIUM. (Colloidal Properties of Polonium.) I. E. Starik, N. I. Alekseenko, and N. G. Rozovskaia. Translated by H. Bourrely from Izvest. Akad. Nauk S.S.S.R., Otdel. Khim. Nauk, 755-63(1956). 17p.

The following methods were used in this attempt to resolve the question of polydispersion of Po solutions: electrochemical separation on copper; adsorption and desorption on glass; centrifugation; ultrafiltration; and radiography. The results of each study are given and discussed. (T.R.H.)

4455 CEA-tr-A246

LES COMPLEXES DE L'ACIDE ÉTHYLÈNEDIAMINE-TETRACÉTIQUE AVEC LE VANADIUM ($-H_4Y$). (Complexes of (Ethylenediamine)Tetra- Acetic Acid with Vanadium ($-H_4Y$).) G. Schwarzenbach and J. Sandera. Translated by B. Moreau from Helv. Chim. Acta 36, 1089-1100(1953). 16p.

The formation of ethylenediaminetetraacetic acid complexes of the type VY^{2-} with divalent vanadium was studied by measurements of the pH. The stability constant of the complex VY^{-} in which the metal had the III valence was obtained from the variation of the oxidation-reduction potential V(III)/V(II) produced during the addition of complexon. Tetravalent vanadium forms the complex VOY^{2-}, which was studied polarographically. Pentavalent vanadium does not form complexes with EDTA. Salts having the yellow color of the anion VY^{-} and the blue color of VOY^{2-} were prepared. (J.S.R.)

4456 CEA-tr-R380

DOSAGE DU BORE DANS LES ROCHES PAR L'ANALYSE NEUTRONIQUE. (Determination of Boron in Rocks by Neutron Analysis.) V. K. Kristyanov (Kristianov) and G. I. Panov. Translated by B. Vinogradoff from Zhur. Anal. Khim. 12, 362-6(1957). 12p.

A method is given for determining B in rocks and minerals without chemical treatment. The method is based on the fact that the neutron capture cross section

of B is 10^3 to 10^4 times that of the other fundamental constituents of rock. Neutron capture by B results in heavy particle emission; thus the sample to be analyzed is placed between a neutron source and a counter, and the counting results are compared with a standard sample. A relative precision of ± 3% is obtained, and variations in the composition of the rock do not interfere noticeably. To avoid interference due to hydrogen, the sample and the standard or control should have the same hydrogen content. (T.R.H.)

4457 CEA-tr-R479

DOSAGE SPECTROCHIMIQUE DE FAIBLES QUANTITÉS D'URANIUM DANS LES ÉCHANTILLONS NATURELS. (Spectrochemical Determination of Uranium in Natural Samples.) T. M. Morochkina, V. K. Prokof'ev (Prokoviev), and M. N. Smirnova. Translated from Zavodskaya Lab. 23, 1324-7(1957). 12p.

A method is given for vaporizing U samples so that improved spectrographic determinations are possible. The sample is melted by special electrodes into a bead which vaporizes readily. Standard samples are run to establish curves for determining U content of unknown samples. Results for about 20 ores and minerals are given, and comparisons with other results indicate a limit of error of ±6%. (T.R.H.)

4458 CEA-tr-R498

ANALYSE SPECTROSCOPIQUE AVEC UTILISATION D'ISOTOPES DE L'HYDROGÈNE DANS LES MÉTAUX. (Spectrographic Analysis of Hydrogen in Metals by Use of Isotopes.) A. N. Zaidel and A. A. Petrov. Translated by D. Geystor from Vestnik Leningrad. Univ. 10, 40-51(1957). 20p.

The application of the method of isotopic equilibrium to the analysis of hydrogen in metals by a spectroscopic determination of the isotopic composition of the equilibrium products in the gaseous phase is discussed. In this spectral-isotopic method, the metal to be analyzed is placed in a quartz tube which is then evacuated. Deuterium is let into the tube, and the tube is heated. After equilibrium between the deuterium and the hydrogen in the metal is reached, a spectrographic analysis is made of the gas in the tube. The precision of the method is good, and the time necessary for equilibrium was no longer than 30 to 60 min for any of the metals tested. Results obtained with some metals are given and compared with the results obtained by the vacuum fusion method. (J.S.R.)

4459 CEA-tr-R551

UTILISATION D'UN GRAPHIQUE GRADUÉ DANS L'ANALYSE SPECTROGRAPHIQUE DES ÉLÉMENTS DES TERRES RARES PAR LA MÉTHODE DES ADDITIONS. (Utilization of a Calibrated Diagram in the Spectrographic Analysis of the Rare Earth Elements by the Method of Additions.) A. I. Akimov. Translated by J. Mayer from Optika i Spektroskopiya 2, 809-11(1957). 8p.

The spectrographic analysis of rare earth elements by the addition method depends on an accurate calculation of the concentration of impurities in the standard, as given by the linear relation $\log R = \log a + b \log(C + x)$, where R is the ratio of the radiation intensities of the pair analyzed, C is the amount of impurity added, x is the impurity already in the standard, and a and b are constants. A simple procedure for the calculation of the concentration x is described. It is a calibrated numerical graph and is based on the hypothesis that the value of coefficient b is known. The method was verified by an analysis of samarium with neodymium as the impurity. (J.S.R.)

4460 CEA-tr-X50

ETUDE DE QUELQUES PHÉNOMÈNES PARTICULIERS DANS LES ÉCHANGEURS D'IONS ACIDES FAIBLES. (Some Particular Phenomena in Weakly Acid Ion Exchangers.) H. Sofue and Y. Tabata. Translated by Sensik Minn from Kôgyô Kagaku Zasshi 59, 728-9 (1956). 5p.

Experiments are described which show that ion exchange occurs in solid phase, though very slowly. Ultraviolet radiation accelerates the reaction considerably. The experiments were performed on C.M.C. Na resin with different degrees of esterification. (T.R.H.)

4461 CEA-tr-X76

ETUDE SUR LA COLORIMETRIE DU FLUOR. (1) METHODE DE LA COULEUR DE LAQUE (lake) ZIRCONIUM-PURPURINE SULFONATE DE SODIUM. (Spectrophotometric Determination of Fluoride. I. Zirconium–Sodium Purpurin Sulfonate Lake Method.) Sakuro Wakimoto. Translated by Sensik Minn from Nippon Kagaku Zasshi 77, 1489-92(1956). 13p.

A colorimetric method for determining fluorine is given. The method is based on the color-producing reaction of F with zirconium-sodium purpurin sulfonate lake (Purpurin-S). As little as 0.02 ppm of F can be determined. The use of specially prepared water and a distillation technique are not necessary. The interference of H_3PO_4, Cl, Fe^{3+}, Al, H_3BO_3 and hard water was studied, and H_3PO_4 was found to interfere only at very low F concentrations. (T.R.H.)

4462 CEA-tr-X-111

LE MÉCANISME DE LA RÉACTION RADIOCHIMIQUE. (The Mechanism of the Radiochemical Reaction.) K. Hiroda. Translated by S. S. Minn from Kôgyô Kagaku Zasshi 60, 808-13(1957). 9p.

The mechanisms of radiochemical reactions are discussed and compared to photochemical reactions. (T.R.H.)

4463 NP-tr-201

A METHOD OF DETERMINING BERYLLIUM IN ORES FROM PHOTONEUTRONS. B. S. Aĭdarkin, G. V. Gorshkov, A. G. Grammakov, V. S. Zhadin, and A. G. Kolchina. Translated by J. M. Crabtree (U.K.A.E.A., Atomic Energy Research Establishment) from Trudy Radievogo Inst. im. V. G. Khlopina 5, 89-93(1957). 9p.

The beryllium content of ores is determined by exposing samples of these materials to gamma radiation and measuring the intensity of the photoneutrons originating in the beryllium. Under proper conditions it is possible to measure the beryllium in samples containing a Be concentration of 0.1%. As the beryllium content increases, the experimental error decreases. (J.R.D.)

4464 TT-773

THE STRUCTURE OF ABSORPTION BANDS OF LIQUID H_2O, D_2O AND HDO DETERMINED BY THE STRUCTURE OF THEIR MOLECULES. (O Strukture Polos Pogloshcheniya Zhidkikh H_2O, D_2O i HDO, Opredeliaemoi Stroeniem ikh Molekul). M. O. Bulanin. Translated by G. Belkov (National Research Council of Canada) from Optika i Spektroskopiya 2, 557-61(1957). 11p.

This paper was previously abstracted from the original language and appears in NSA, Vol. 12, as abstract No. 7155.

4465

PSEUDOCRITICAL CONSTANTS FROM VOLUMETRIC DATA FOR GAS MIXTURES. J. M. Prausnitz and R. D. Gunn (Univ. of California, Berkeley). A.I.Ch.E. Journal 4, 494(1958) Dec.

A method is presented, based on an extended theorem of corresponding states, to estimate the volumetric properties of pure, nonpolar, or slightly polar fluids with an accuracy of ~2% or better. (W.L.H.)

4466

A NEW TYPE OF COUNTERCURRENT COLUMN FOR THE ZIRCONIUM–HAFNIUM SEPARATION. Nadine Isaac and R. L. de Witte (Centre d'Etudes pour les Applications de l'Energie Nucleaire, Brussels). A.I.Ch.E. Journal 4, 498(1958) Dec.

The column proposed for the separation of Zr from Hf consists of a cylindrical tube, in which moves a coaxial rod to which several plates are securely attached. A simple electromagnetic device or a mechanical vibrating system makes this control rod vibrate at 3,000 cycles/min with an amplitude of $\frac{1}{25}$ inch. The countercurrent liquid movement is assured through the holes of the plates and through the annular space between these plates and the wall of the column. The particular shape of the holes increases the contact time between the two phases at each plate level by creating a secondary local countercurrent. (W.L.H.)

4467

RADIOCHEMICAL SEPARATIONS OF INDIUM. D. N. Sunderman, I. B. Ackermann, and W. W. Meinke (Univ. of Michigan, Ann Arbor). Anal. Chem. 31, 40-4(1959) Jan.

The radiochemical separation of indium by sulfide precipitation, solvent extraction of the bromide with diethyl ether, extraction with thenoyl trifluoroacetone and anion exchange in hydrochloric acid solution has been critically evaluated. Comparison of the efficiency of separation from 15 representative radioactive tracers showed that the sulfide precipitation lacked specificity as a decontamination step. Its primary utility is for the final preparation of counting plates or as a step preliminary to the determination of carrier yield by hydrous oxide precipitation. Ether extraction of the bromide gave decontamination factors as high as 10^4 for many dissimilar elements when conditions were well standardized. Thenoyltrifluoroacetone extractions gave decontaminations of 100 to 1000 for most elements. The anion exchange technique, when operated far from equilibrium with a short column, gave decontamination factors of about 10^3 for many elements with a procedure that requires 1 hour. (auth)

4468

DETERMINATION OF HYDROGEN IN ALKALI METALS BY ISOTOPE DILUTION METHOD. Ben D. Holt (Argonne National Lab., Lemont, Ill.). Anal. Chem. 31, 51-4(1959) Jan.

The rapid exchange of hydrogen and deuterium in sodium or NaK affords a convenient method for hydrogen determination in these metals. Spikes equivalent to 5 to 250 ppm of hydrogen were recovered on 2-gram samples with a standard deviation, from the quantity added, equivalent to ±2 ppm. An 8-in. borosilicate sampling tube serves as the reaction vessel and as the gas bulb for mass spectrometric analysis. With many such tubes on hand, samples can be taken at sites of industrial operations and transported to the laboratory for analysis. In the analysis of NaK it is necessary to apply a correction factor to compensate for the effect of different rates of formation of the hydrides and deuterides in the cooler zones of the tube during equilibration. For sodium this effect is negligible and no correction is necessary. The time required for analysis after the sample is taken is about ¾ hour. (auth)

4469

GAS ANALYSIS BY OPTICAL INTERFEROMETRY. Donald N. Hanson and Arturo Maimoni (Univ. of California, Berkeley). Anal. Chem. 31, 77-82(1959) Jan.

The theory and experimental techniques used for analyzing mixtures of hydrogen–nitrogen and deuterium–nitrogen over the entire range of compositions are given. The optical interferometer is a reliable gas analytical tool capable of yielding accurate results in binary mixtures, and the deviations from linearity of the data for index of refraction vs. composition can be adequately explained from molar refraction theory and the predicted deviations from ideal gas mixing behavior. The index of refraction for deuterium for white light is slightly smaller than that of hydrogen: 1.80×10^{-6}. (auth)

4470

CRYSTALLOGRAPHIC DATA NO. 177. URANIUM MONONITRIDE. Charles P. Kempter, Joseph C. McGuire, and M. R. Nadler (Los Alamos Scientific Lab., N. Mex.). Anal. Chem. 31, 156-7(1959) Jan.

The crystal structure of uranium nitride was found to be face-centered cubic with a lattice constant of 4.88 ± 0.001 A. It was concluded that the structure was of the NaCl type since the 420 reflection was of much greater intensity than the 331 reflection. The calculated density was 14.32 g per cc, and the U-N bond distance for coördination number 6 was 2.4449 A. (J.E.D.)

4471

ION EXCHANGE SEPARATION OF METAL IONS. James S. Fritz and Gerald R. Umbreit (Iowa State Coll., Ames). Anal. Chim. Acta 19, 509-16(1958) Dec.

An ion exchange method that depends on the selective complexation of metal ions by EDTA (ethylenediaminetetraacetic acid) is discussed. Selectivity is achieved by proper choice and control of pH. The uncomplexed metal ions are retained by a short cation exchange column, while the complex metals pass quantitatively through the column. Quantitative ion exchange separations are attained quickly because a short (4-cm) column is used. Excellent pH control is effected by incorporating a buffer in the sample to the separated and by treating the resin column with the same buffer solution. The ion exchange retention of several metal cations in EDTA solution was studied as a function of pH. From the behavior of individual ions, predictions can be made as to the mixtures that can be separated by this method. Several actual separations are reported. (J.H.M.)

4472

POLAROGRAPHIC ESTIMATION OF SOLUBLE SILICA IN URANYL NITRATE. A. K. Sundaram and M. Sundaresan (Atomic Energy Establishment, Bombay). Anal. Chim. Acta 19, 601-3(1958) Dec.

A method is described for the estimation of soluble silica in uranyl nitrate based on the polarographic reduction of the silicomolybdate. Uranium does not interfere in the estimation, and hence no separations are involved. Amounts as low as 2 ppm of silica in uranyl nitrate can be estimated with an error less than 10%. (J.H.M.)

4473

A REACTION BETWEEN mesoINOSITOL AND URANYL ACETATE. P. Meredith and H. G. Sammons (Univ. of Birmingham, Eng.). Analyst 83, 686(1958) Dec.

A reaction has been observed between mesoinositol and uranyl acetate solutions which may provide the basis for a method of detection on paper chromatograms and for determination in solution after chromatographic separation from other polyols. (W.L.H.)

4474

DETERMINATION OF URANIUM IN FLOTATION CONCENTRATES AND IN LEACH LIQUORS BY X-RAY FLUORESCENCE. G. L. Smithson, R. L. Eager, and A. B. VanCleave (Univ. of Saskatchewan, Saskatoon, Can.). Can. J. Chem. 37, 20-8(1959) Jan.

X-ray fluorescence has been applied to the analysis of flotation concentrates obtained from pegmatitic uranium ores occurring in Northern Saskatchewan. Approximate uranium analyses can be obtained by direct measurement on flotation concentrates, but more accurate results are obtained by using an internal standard such as strontium or yttrium. The time required for an analysis, as compared to that of conventional chemical or fluorimetric methods, is considerably reduced, and flotation pilot plant operations can therefore be more effectively controlled. The method has been extended to include the analysis of sulfate leach liquors obtained from the leaching of pegmatitic ores and their flotation concentrates. Organic phases obtained in liquid–liquid extraction studies can also be rapidly analyzed for uranium by x-ray fluorescence. (auth)

4475

PHOTOCHEMICAL SEPARATION OF MERCURY ISOTOPES. II. THE REACTION OF $Hg^{202}6(^3P_1)$ ATOMS, PHOTOEXCITED IN NATURAL MERCURY VAPOR, WITH WATER VAPOR AND OTHER HgO-FORMING SUBSTRATES. R. Pertel and H. E. Gunning (Univ. of Alberta, Edmonton, Can. and Illinois Inst. of Tech., Chicago). Can. J. Chem. 37, 35-42(1959) Jan.

An investigation has been made of the reaction of $Hg^{202}(^3P_1)$ atoms, photoexcited in natural mercury vapor, with several HgO-forming substrates, including water vapor, nitrous oxide, and oxygen. The reactions were carried out under flow conditions at room temperature. Emphasis has been placed on the Hg^{202} content of the HgO product. Enrichment in Hg^{202} would be evidence of the primary formation of a mercury compound. In the reactions with nitrous oxide and oxygen, it was found that the HgO product contained the normal abundance of Hg^{202}. With water vapor, a product containing up to 35% Hg^{202} was obtained, compared to the normal abundance of 29.8%. The addition of 1,3-butadiene to the water vapor substrate was found to have a marked effect on the enrichment in Hg^{202} in the HgO product. A product containing 85% Hg^{202} was recovered when the substrate contained 21 mole % of added butadiene. A systematic study of the effect of butadiene concentration on the enrichment reaction showed that the Hg^{202} content remains constant for butadiene concentrations exceeding approximately 10 mole %. The water–butadiene reaction is recommended as a simple method for preparing Hg^{202} from natural mercury. The factors influencing the enrichment process are discussed, together with the significance of the results with respect to the mechanisms of decomposition of the molecules studied. (auth)

4476

THE ADSORPTION OF KRYPTON ON GRAPHITE ABOVE AND BELOW THE TRIPLE POINT. H. L. McDermot and B. E. Lawton (Defence Research Chemical Labs., Ottawa). Can. J. Chem. 37, 54-7 (1959) Jan.

The adsorption of krypton on graphite has been measured above and below its triple point. Above the triple point, a smooth isotherm was found which showed two types of hysteresis. In contrast, the isotherm measured below the triple point displayed two discontinuities. The surface area of this graphite measured by means of the krypton isotherm was found to be in agreement with that previously measured by nitrogen adsorption. (auth)

4477

THE HEAT AND ENTROPY OF ASSOCIATION OF THE COMPLEX IONS FORMED BY EDTA WITH THE LANTHANIDE ELEMENTS IN AQUEOUS SOLUTION. R. H. Betts and Olive F. Dahlinger (Atomic Energy of Canada, Ltd., Chalk River, Ont.). Can. J. Chem. 37, 91-100(1959) Jan.

A radio tracer method has been used to measure the heat and entropy of association of all the lanthanide ions (except promethium) with the chelating agent EDTA. Entropy terms are largely responsible for the remarkable stability of these complex ions. The results suggest, but do not prove, that a change in configuration of the complex occurs after gadolinium (element 64). (auth)

4478

APPLICATION OF ION EXCHANGERS TO THE SEPARATION OF RARE EARTHS. Walter Noddack (Staatlichen Forschungsinstitut für Geochemie, Bamberg, Ger.). Chem. Tech. (Berlin) 10, 586-90(1958) Oct. (In German)

The application of ion exchangers to the industrial separation of rare earths was investigated. The method investigated was the combined application of complex formation and ion exchange. The rare earths were placed in solution with a complex-forming tribasic acid, and the solution was brought in contact with a basic ion exchanger. The factors which affect the separation, the exchanger, complexing agent, concentration of the solution, pH, dimensions of the separation column, size of the fraction used, velocity of the passage, and kind of heavy metals used were investigated. The procedure used is described, and the results of the first and second separation stages are given. (J.S.R.)

4479

COMPLEX FORMATION AND ELUTION OF RARE EARTHS. Leopold Wolf. Chem. Tech. (Berlin) 10, 590(1958) Oct. (In German)

A brief review is given of the results of work done on the complex formation and complex elution of rare earths from ion exchangers is presented. The type, structure, solubility velocity, stability, and stability range of the complexes formed were studied. (J.S.R.)

4480

THE PRODUCTION OF LARGE QUANTITIES OF RARE EARTHS BY ION EXCHANGE METHODS. Joachim Massonne (Karl-Marx-Universitat, Leipzig). Chem. Tech. (Berlin) 10, 591-9(1958) Oct. (In German)

The displacement elution of rare earths from ion exchange columns is investigated. The separating effect of nitrilotriacetic acid is considered. The effect of various

parameters on the separation and the possibility of a series column method are discussed. The operating conditions which are necessary for an economical separation are high separation factor, small h value for the separation column, small value for $X_T/X_B + V_T/V_B$ for each rare earth (where X_T is the length of the overlapping zone in the column X_B is the band length, V_T is the volume of the overlapping fraction, and V_B is the volume of the band), high column production yield, low time span for the separation, elimination of precipitate formation in the exchange columns, and recovery of the eluant. Each of these factors is considered. (J.S.R.)

4481

ANALYSIS OF ORGANOFLUORINE COMPOUNDS. SIMULTANEOUS MICRODETERMINATION OF FLUORINE AND NITROGEN IN ORGANIC COMPOUNDS. N. E. Gel'man, M. O. Korshun, et al. (Inst. of Elementary Organic Compounds, Academy of Sciences, USSR). Doklady Akad. Nauk S.S.S.R. 123, 468-70 (1958) Nov. 21. (In Russian)

Simultaneous determinations of fluorine and nitrogen were achieved by introducing magnesium oxide into the disintegration zone of the substance during the determination of nitrogen by the Dumas method, followed by fluorine capture and pyrohydrolysis of the magnesium fluoride. The order of accuracy for nitrogen determination was 0.2% and for fluorine up to 0.5% abs. (R.V.J.)

4482

REACTIONS BETWEEN METALS AND REFRACTORIES AT HIGH TEMPERATURES. A. N. Novikov. pp. 441-7 in "Fiz.-khim. osnovy keramiki." Moscow, Promstroyizdat, 1956.

The possibility of reactions between metals and oxides at high temperatures is examined by thermodynamic analysis. Data are cited on the heats of formation of the most common refractory oxides and their dissociation pressures at 298 to 2000°K. The maximum work performed in the reactions of ThO_2, CaO, MgO, BeO, and Al_2O_3 with Pb, Fe, Ti, Zr, and C was calculated. A simplified method of evaluating the stability of metal–oxide systems by the differences in the heats of formation of the corresponding oxides is presented. If the ratio of the difference between the heats of formation of refractory oxides and metal oxides is more than 50% of the heat of formation of the refractory oxide, there is little possibility of a reaction between the metal and oxide, but if it is less than 50%, reaction is possible. Data on the simplified method are assembled in tabular form. (TCO)

4483

A METHOD FOR DETERMINING THE TEMPERATURE OF THE LIQUIDUS AND THE SOLIDUS IN STUDIES OF FUSIBILITY DIAGRAMS AND PHASE DIAGRAMS OF HIGHLY REFRACTORY OXIDES. P. P. Budnikov and S. G. Tresvyatskiy. pp. 520-36 in "Fiz.-khim. osnovy keramiki." Moscow, Promstroyizdat, 1956.

Data from the literature are used to obtain methods for determining the temperature of the liquidus in systems smelted in air, in an inert gas atmosphere, or in a vacuum. A method of annealing and hardening refractories is briefly described. A detailed discussion is given of a method of thermal analysis at high temperatures by the use of W–Mo thermocouples. Fusion and crystallization curves of Al_2O_3, SiO_2, Mg_2SiO_4, $CaAl_2O_4$, and CaF_2, obtained by the W–Mo thermocouple method, are given. (TCO-J.S.R.)

4484

ISOTOPIC COMPOSITION OF THE COMMON LEAD OF JAPAN. Hitoshi Sakai and Kazuo Sato (Univ. of Tokyo). Geochim. et Cosmochim. Acta 15, 1-5(1958) Nov.

Lead tetramethyl was synthesized from lead iodide isolated from 14 galenas, 2 anglesites, and 6 pyromorphites of Japan. The mass spectrometric analysis was carried out for the peaks of lead and lead hydride ions. The isotopic compositions of leads from these minerals lie within a narrow range. The average values for galenas are 18.51 ± 0.05 for Pb^{206}/Pb^{204}, 15.60 ± 0.05 for Pb^{207}/Pb^{204}, and 38.76 ± 0.15 for Pb^{208}/Pb^{204}. For lead of secondary minerals they are 18.52 ± 0.05, 15.62 ± 0.05, and 38.78 ± 0.15, respectively. No detectable difference was observed between the isotopic compositions of primary and secondary lead ores. The ratios, U^{238}/Pb^{204} and Th^{232}/U^{238}, in the source magma are estimated from the lead abundances. They are 9.10 ~10.0 and 3.81 ~4.00, respectively. (auth)

4485

FRACTIONATION OF SULPHUR ISOTOPES IN VOLCANIC GASES. H. Sakai and H. Nagasawa (Univ. of Tokyo). Geochim. et Cosmochim. Acta 15, 32-9(1958) Nov.

The S^{34}/S^{32} ratios in several samples of SO_2 and H_2S from the fumaroles of Volcano Showashinzan, Japan, were measured. The outlet temperature of the fumaroles from which the samples were collected ranged from 100 to 661°C. It was observed that the lower the outlet temperature of the fumarole, the higher the content of the heavy isotope in the SO_2. The isotopic ratio of H_2S was found, on the other hand, to be almost constant throughout the range of temperature given above. This isotopic fractionation between SO_2 and H_2S was ascribed to the reaction $H_2S + 2H_2O \rightleftharpoons SO_2 + 3H_2$. The temperatures estimated from the observed fractionation factors and the theoretical ones were in fairly good agreement with the observed outlet temperatures. The isotopic ratio of both compounds can be reasonably explained by a simplified system containing only H_2S, H_2O, SO_2, and H_2. Some difficulty arises when the chemical compositions of the actual fumaroles are taken into consideration. (auth)

4486

ON THE ISOTOPIC COMPOSITION OF THE AMMONIA AND THE NITRATE ION IN RAIN. Erik Eriksson (Univ. of Chicago). Geochim. et Cosmochim. Acta 15, 153(1958) Nov.

It is pointed out that rain does not remove all the nitrogen compounds from the air mass. Both ammonia and nitrogen oxides occur in the gas phase in equilibrium with the liquid phase. If the liquid phase is removed by gravitational pull, there is always the gaseous phase left. A fractionation effect may be expected, therefore, in nitrogen isotopes between the gaseous and liquid phases, the heavier isotope being probably enriched in the liquid phase. Isotopic enrichment in ammonia and nitrate ion are discussed and correlated with other data. (L.T.W.)

4487

A REPLY TO THE PRECEDING NOTE BY E. ERIKSSON. T. C. Hoering (Univ. of Arkansas, Fayetteville). Geochim. et Cosmochim. Acta 15, 154-5(1958) Nov.

The possibility of the mechanism described in the preceding paper (see preceding abstract) to account for the observed distribution of the stable isotopes of

nitrogen between ammonia and nitrate fractions of rain water is discussed, and a test of it is proposed. (L.T.W.)

4488

CORROSION REVIEW FOR 1958. Anton de S. Brasunas. Ind. Eng. Chem. 51, No. 1, 93A-5A(1959) Jan.

Corrosion research efforts, foreign and domestic, in 1958 are briefly summarized. References to especially significant research are given. (D.E.B.)

4489

AQUEOUS REPROCESSING OF NUCLEAR FUELS. Charles L. Peterson, et al. (Battelle Memorial Inst., Columbus, Ohio) and Walter E. Clark (Oak Ridge National Lab., Tenn.). Ind. Eng. Chem. 51, 32-7(1959) Jan.

A feasible corrosion-resistant container material for the single-unit Zircex hydrochlorinator-dissolver is not apparent at present. Of the materials studied, the best choice is Haynes 25. Its use would require that penetration rates of approximately 3 mils per month be tolerated. The process should be run in two steps. Several materials, such as Inconel, Haynes 25, Type S-816, Illium R, and nickel, appear promising for construction of the hydrochlorinator. The cold residue would then be dissolved by transferring it to a container made from titanium or tantalum. Preliminary experiments in the alternate liquid-phase Zircex hydrochlorination system employing fused aluminum chloride–ammonium chloride indicate that nickel and the Hastelloys may be satisfactory for construction of the hydrochlorinator. Molybdenum appears even better from a corrosion standpoint. In the Darex system unalloyed titanium appears highly satisfactory for any part of the apparatus, with expected maximum corrosion of about 0.1 mil per month. No deleterious effects are expected around weldments or at points of high stress levels. The siliceous scale which forms in the dissolver can be removed by treatment with boiling 10% sodium hydroxide with no adverse effect on the corrosion resistance of the titanium. Corrosion rates for tantalum are negligible in all cases, but this metal is subject to hydrogen embrittlement when employed as the dissolver material. Other possible materials of construction are Haynes 21, with a corrosion rate of less than 0.5 mil per month, and Type S-816, with less than 1 mil per month. These results are derived from laboratory scale experiments. Pilot-plant evaluations on a larger scale are recommended prior to any plant construction based on these data. (auth)

4490

TRIALKYL PHOSPHATES AND DIALKYL ALKYL-PHOSPHONATES IN URANIUM AND THORIUM EXTRACTION. T. H. Siddall, III (E. I. du Pont de Nemours & Co., Aiken, S. C.). Ind. Eng. Chem. 51, 41-4(1959) Jan.

The ability of organic compounds that contain the phosphoryl group to extract lanthanides, actinides, and zirconium has been reported. However, most of the work reported has dealt with tri-n-butyl phosphate (TBP) and not with efforts to improve selectivity by altering the substituents on the phosphorus atom. The objective of the work presented was to examine the potential of several trialkyl phosphates and dialkyl alkylphosphonates for extracting uranium and thorium from nitric acid solutions and for separating them from zirconium. (auth)

4491

RECOVERY OF FISSION PRODUCT NOBLE GASES. Meyer Steinberg and Bernard Manowitz (Brookhaven National Lab., Upton, N. Y.). Ind. Eng. Chem. 51, 47-50(1959) Jan.

An advantage of using an absorption-stripping system over charcoal adsorption is that the noble gas can be removed almost completely in a continuous operation at ambient temperatures. A difficulty with the Amsco absorption-stripping method is that relatively large volumes of organic have to be handled when operating at atmospheric pressure. The absorption-stripping system could be advantageously used where an inexpensive "head end" or primary bulk separation of gaseous activity is required, either for storage until safe disposal to the atmosphere is allowable, or for further processing for complete enrichment or purification of xenon and krypton. Other possibilities include the processing of homogeneous reactor purge gas streams, where a suitable carrier gas, such as helium, can be chosen to allow an increased single-stage concentration factor. This could also be used in processing gas streams from pyrometallurgical processing plants, where there is freedom in the choice of a vehicle gas in purging the gaseous fission products. (auth)

4492

CONCENTRATED NITRIC AND DILUTE HYDROFLUORIC ACID MIXTURES IN DISSOLUTION OF ZIRCONIUM METAL. E. M. Vander Wall and E. M. Whitener (Phillips Petroleum Co., Idaho Falls, Idaho). Ind. Eng. Chem. 51, 51-4(1959) Jan.

In mixtures of nitric and hydrofluoric acids the rate of dissolution of zirconium metal is first-order with respect to the hydrofluoric acid. Varying the nitric acid concentration from 0 to 13M causes a small change in the initial rate of dissolution, which indicates that nitric acid is not necessary for dissolution. However, the presence of 13M nitric acid produces stable solutions which have a final total fluoride-zirconium molar ratio of 2. Rate constants are given for the initial rate of dissolution of zirconium at 40, 50, 60, and 115°C, and for the disappearance of hydrofluoric acid during dissolution at 40, 50, and 60°C in the region where the total fluoride-zirconium molar ratio is 6 or greater. Evidence confirms the necessity of the hydrofluoric acid species itself for dissolution, rather than the fluoride ion species. The activation energy for the dissolution of zirconium in the nitric–hydrofluoric acid system is 6.4 kcal per mole for the temperature range 40 to 115°C. (auth)

4493

RECOVERY OF NEPTUNIUM-237 FROM PROCESS RESIDUES BY SOLVENT EXTRACTION. J. R. Flanary and J. H. Goode (Oak Ridge National Lab., Tenn.). Ind. Eng. Chem. 51, 55-7(1959) Jan.

A solvent extraction process, utilizing tributyl phosphate as the extractant, was developed and proved on a semiworks scale for the separation of neptunium from processing residues. This extends the usefulness of tributyl phosphate as a solvent for the recovery of the heavy elements, adding neptunium to thorium, uranium, and plutonium. Standard laboratory techniques of batch equilibrations and batch countercurrent experiments, using tracer techniques, established optimum conditions for primary extraction of uranium and neptunium and their separation. Results of these tests were confirmed in a pulsed column demonstration. (auth)

4494

SOLVENT EXTRACTION OF HEAVY METAL CHELATES WITH FURFURAL. F. K. Cole and L. H. Brown (Quaker Oats Co., Barrington, Ill.). Ind. Eng. Chem. 51, 58-9(1959) Jan.

Furfural is an effective selective solvent for the separation of uranium–thorium, zirconium–hafnium, and niobium–tantalum chelate mixtures. A possible thorium–rare earth separation has been pointed out. Furfural is relatively stable to aqueous nitric acid. All this points the way toward future work on the development of commercial methods for the separation of metals using inexpensive and readily available furfural as an extraction solvent. (auth)

4495

MEMBRANE ELECTRODIALYSIS OF SIMULATED PRESSURIZED WATER REACTOR COOLANT. Paul Cohen (Westinghouse Bettis Plant, Pittsburgh). Ind. Eng. Chem. 51, 66-7(1959) Jan.

A membrane electrodialyzer can purify the coolant of a pressurized water reactor at influent concentrations as low as 0.5 to 3.0 megohm-cm specific resistance. Such a unit can be operated without difficulty at 1500 psi. Under conditions of constant flow, purification efficiency is independent of influent concentration; current efficiency decreases with decrease of influent concentration. (auth)

4496

FISSION-PRODUCT RUTHENIUM VOLATILITY AT HIGH TEMPERATURES. K. L. Rohde, C. E. May, et al. (Phillips Petroleum Co., Idaho Falls, Idaho). Ind. Eng. Chem. 51, 68-70(1959) Jan.

When a nitrate salt or acid solution containing fission-product ruthenium is decomposed thermally above 100°C, the ruthenium is oxidized in a local reaction, i.e., within the liquid or on the surface of the solid being formed, and appears as a volatile material, probably the tetroxide. Appreciable concentrations of nitrite ion added to the aqueous feed did not inhibit this oxidation, and it has been concluded that it would be difficult in practice to balance large quantities of fluidizing air or other oxidizing atmospheres with aqueous reducing agents. When the atmosphere in which the decomposition took place was reducing with respect to ruthenium tetroxide, i.e., in the presence of nitric oxide, the volatile tetroxide was not formed or the oxidation reversed so close to the solid that the ruthenium essentially remained on the alumina. Where the operating temperature was higher, 550 instead of 400°C, the ruthenium was found not so much on the solid as on the equipment in the high temperature region, suggesting that the ruthenium tetroxide did not decompose adjacent to the solid, where the temperature was limited by the evaporation of liquid, but rather on the heated walls of the equipment. (auth)

4497

THE DETERMINATION OF GOLD IN BIOLOGICAL MATERIALS BY NEUTRON ACTIVATION ANALYSIS. D. Gibbons (Atomic Energy Research Establishment, Harwell, Berks, Eng.). Intern. J. Appl. Radiation and Isotopes 4, 45-9(1958) Dec.

The determination of gold in biological materials by neutron irradiation followed by radiochemical purification of the resulting radioactive gold is described. As little as 10^{-10} g of gold can be determined with an accuracy of about 2 per cent. A simplified and more rapid method is also described for use where an accuracy of 50 to 10 per cent is sufficient. (auth)

4498

THE ACID HYDROLYSIS (AQUATION) OF THE TRICHLOROAMMINEPLATINATE(II) ION. Thomas S. Elleman, John W. Reishus, and Don S. Martin, Jr. (Iowa State Coll., Ames). J. Am. Chem. Soc. 80, 536-41(1958).

The acid hydrolysis of $[Pt(NH_3)Cl_3]^-$ in aqueous solution has been studied by spectrophotometric and potentiometric titration techniques in the temperature range of 0 to 35°C. For the first hydrolysis: $[Pt(NH_3)Cl_3]^- + H_2O \underset{k_{-1}}{\overset{k_1}{\rightleftharpoons}} [Pt(NH_3)Cl_2(H_2O)] + Cl^-$, k_1 is 3.6×10^{-5} sec^{-1} and k_{-1} is 2.5×10^{-3} l $moles^{-1}$ sec^{-1} at 25°C. $\Delta H_1 \pm$ is 18.9 kcal and $\Delta H_{-1} \pm$ is 16.8 kcal. The existence of a second acid hydrolysis has been demonstrated: $[Pt(NH_3)Cl_2(H_2O)] + H_2O \underset{k_{-2}}{\overset{k_2}{\rightleftharpoons}} [Pt(NH_3)Cl(H_2O)_2]^+ + Cl^-$. Approximate values $K_2 = k_2/k_{-2} = 4 \times 10^{-6}$ mole/l and $k_{-2} = 0.2$ l/mole sec at 24°C were indicated. (auth)

4499

SURFACE TENSION OF SOME LIQUID OXIDES AND THEIR TEMPERATURE COEFFICIENTS. W. D. Kingery (Massachusetts Inst. of Tech., Cambridge). J. Am. Ceram. Soc. 42, 6-10(1959) Jan.

Surface-tension data are reported for liquid Al_2O_3, B_2O_3, GeO_2, P_2O_5, and SiO_2. Abnormal positive temperature coefficients for B_2O_3, GeO_2, and SiO_2 are shown to be due mainly to changes in the liquid structure (dissociation) with temperature. (auth)

4500

COMPATIBILITY OF NIOBIUM WITH BISMUTH. G. W. Parry and L. W. Graham (Hawker Siddeley Nuclear Power Co., Ltd., Langley, Slough, Bucks, Eng.). J. Inst. Metals 87, 125-6(1958) Dec.

A series of tests was made to determine the solubility of Nb in Bi at 600°C and its compatibility at 1000°C. The results indicated that Nb is not a suitable material for the containment of liquid Bi even under oxygen-free conditions. In nonisothermal systems operating below 600°C Nb loops suffer from more serious mass-transfer effects than systems constructed from low-alloy steels. (J.E.D.)

4501

THE RADIATION-INDUCED FORMATION OF AMMONIA. C. H. Cheek and V. J. Linnenbom (U. S. Naval Research Lab., Washington). J. Phys. Chem. 62, 1475-9(1958) Dec.

The formation of ammonia in mixtures of nitrogen and hydrogen exposed to cobalt-60 γ radiation has been investigated at gas pressures up to 100 atmospheres. The ammonia concentration increases linearly with dose, the rate depending on the first power of the partial pressure of nitrogen. The rate also depends on the first power of the partial pressure of hydrogen at low pressures, but becomes independent as the partial pressure of hydrogen is increased. In a radiation field of 3.4×10^5 r/hr, at a nitrogen partial pressure of 34 atmospheres, the rate of ammonia production increases with increasing hydrogen pressure to 1.2×10^{-5} mole/l-hr at about 14 atmospheres, and then remains constant as the hydrogen pressure is further increased. The rate is also proportional to the dose rate. The reaction is strongly inhibited by oxygen. Added rare gases increase the rate, due to partial utilization of radiant energy primarily absorbed by rare gas atoms. Transfer of excitation energy from rare gases to nitrogen is sug-

gested to be the principal cause of the increased rate. Addition of Pyrex wool to give a 40-fold increase in surface area does not affect the rate. Radiant energy primarily absorbed by hydrogen does not appear to contribute appreciably to ammonia production. A G-value for ammonia production of 0.7 is estimated for a stoichiometric mixture of nitrogen and hydrogen. (auth)

4502

ELECTRICAL CONDUCTANCE OF THE LiCl–KCl EUTECTIC MELT CONTAINING HALIDES AND ALKALI TITANIUM FLUORIDES AS SOLUTES. George J. Janz, C. T. Brown, H. J. Gardner, and C. Solomons (Rensselaer Polytechnic Inst., Troy, N. Y.). J. Phys. Chem. 62, 1479-82(1958) Dec.

The electrical conductances over the temperature range 350 to 400° of the LiCl–KCl eutectic melt and solutions of NaCl, LiF, NaF, KF, Li_2TiF_6, Na_2TiF_6, and K_2TiF_6 in this melt are reported for the region of dilute concentrations of the solutes. A reduced total specific conductance is found on the addition of fluorides to the chloride eutectic. The decrease in total conductance on the addition of the alkali titanium fluorides to the chloride melt is interpreted in light of the previous cryoscopic results as due to a primary dissociation with the formation of alkali fluoride and TiF_4, the latter most probably existing as $(TiF_4Cl_2)^{-2}$ or some similar complex ion. (auth)

4503

THE PREPARATION AND PROPERTIES OF NpF_6; A COMPARISON WITH PuF_6. John G. Malm, Bernard Weinstock, and E. Eugene Weaver (Argonne National Lab., Lemont, Ill.). J. Phys. Chem. 62, 1506-8(1958) Dec.

The NpF_6 was prepared in a rather unique fluorination reactor. The unique feature of this fluorination reactor is the use of liquid fluorine which drips from the liquid nitrogen cooled condenser onto the heated charge (NpF_4 of PuF_4). This results in a high concentration of F_2 in the hot zone and sets up violent convection currents which sweep the volatile hexafluoride from the reaction zone to the condenser. The physical properties, infrared spectrum, magnetic susceptibility, and chemical properties are reported for the prepared NpF_6. A comparison with PuF_6 is also reported. (W.L.H.)

4504

THE ADSORPTION OF GASES ON ION EXCHANGED MICA. I. ARGON AND KRYPTON ISOTHERMS AND BET SURFACE AREA MEASUREMENTS. George L. Gaines, Jr. and C. P. Rutkowski (General Electric Research Lab., Schenectady, N. Y.). J. Phys. Chem. 62, 1521-5(1958) Dec.

The adsorption properties of ground muscovite mica bearing potassium, barium, or cesium as exchangeable ions on its surfaces have been studied. Isotherms for argon at 77°K from $p/p_0 = 3.5 \times 10^{-7}$ to 0.75 and at 90°K from $p/p_0 = 2 \times 10^{-7}$ to 0.3 are presented. These data are sufficient for the estimation of thermodynamic functions. Some data for krypton adsorption also are given. The effects of the ionic substitutions on the isotherms are noted, and the applicability of the BET method of surface area measurement to these data is discussed. (auth)

4505

THE ADSORPTION OF GASES ON ION EXCHANGED MICA. II. THERMODYNAMICS OF RARE GAS ADSORPTION. George L. Gaines, Jr. (General Electric Research Labs., Schenectady, N. Y.). J. Phys. Chem. 62, 1526-30(1958) Dec.

Heats and entropies of adsorption for argon and krypton on ion exchanged micas have been computed from the data in the preceding paper. These are presented and discussed in the light of knowledge of the nature of mica cleavage surfaces. Details of adsorption in the first layer can be rationalized by essentially geometrical considerations. When large, polarizable cations and adsorbate atoms are involved, the character of the adsorption is modified. The applicability of the BET theory to these systems seems to depend on a "smoothing" of the surface in the earlier stages of adsorption. Some possibilities for further applications of mica cleavage surfaces in increasing our understanding of physical adsorption phenomena are suggested. (auth)

4506

THE EXCHANGE OF F^{18} BETWEEN METALLIC FLUORIDES AND SILICON TETRAFLUORIDE. Theodore A. Gens, John A. Wethington, Jr., and A. R. Brosi (Univ. of Florida, Gainesville and Oak Ridge National Lab., Tenn.). J. Phys. Chem. 62, 1593(1958) Dec.

Alkali fluorides containing F^{18} were prepared by the reaction $F^{19}(p,pn)F^{18}$. The exchange reaction was studied by circulating SiF_4 in a closed system over the alkali halide and through a counter. (W.L.H.)

4507

A MOVING BOUNDARY METHOD FOR THE DETERMINATION OF TRANSPORT NUMBERS IN PURE FUSED SALTS. Frederick R. Duke and James P. Cook (Iowa State Coll., Ames). J. Phys. Chem. 62, 1593-4(1958) Dec.

A method is described for determining the transport numbers in fused salts by visual observation of the boundary between the salt under investigation and a following indicator salt. (W.L.H.)

4508

THE DIFFUSION OF ARGON AND TRITIUM IN LIQUID NITROGEN. G. Cini-Castagnoli, G. Pizzella, and F. P. Ricci (Univ. of Rome). Nuovo cimento (10) 10, 300-9(1958) Oct. 16.

The diffusion coefficients of Ar and HT in liquid N_2 were measured by using the capillary method at low concentrations and at constant pressure (about 70 cm Hg) within a range of temperatures from 67 to 76°K. The results can be expressed by the equations $D(A\text{-}N_2) = 730 \exp([-260/T]) \times 10^{-6}$ cm²/s and $D(HT\text{-}N_2) = 1260 \exp([-260/T]) \times 10^{-6}$ cm²/s. These results are discussed in terms of the dependence of the diffusion coefficient upon the molecular parameters of the different substances. (auth)

4509

BORON TRIFLUORIDE AND ITS COMPLEXES. Z. Csűros and Gy. Deák (Univ. of Budapest). Periodica Polytechnica Chem. Eng. 2, 135-43(1958).

In the investigations on boron trifluoride and its complexes, it was established that there is a relationship between the chemical character of the solvent and the quantity of the catalyst necessary for the completion of the reaction. As the reaction product with the boron trifluoride forms a complex, the stoichiometric quantity is necessary in aprotic solvents, but in amphiprotic solvents catalytic amounts are sufficient. It was established that the use of amphiprotic solvents inhibits the appear-

ance of secondary products in consecutive reactions and therefore increases the yield of the principal product. (tr-auth)

4510

POLAROGRAPHIC DETERMINATION OF FLUORIDES. J. Volf and J. Havronkova. Pracovní lékařství No. 3, 253-6(1958) Oct. (In Czech.)

A method for the indirect polarographic determination of fluoride and fluosilicate ions was developed with the aid of a suitable azo-dye. The polarographic method is rapid, reliable, and sufficiently sensitive, especially when made in series. One microgram of fluoride can be determined in 10 ml of the polarographic solution; the order of accuracy is ~7%. (R.V.J.)

4511

PHENOMENA OF SURFACE FLUIDITY DURING OXIDATION AT HIGH TEMPERATURES. THE CASE OF ZIRCONIUM AND ITS ALLOYS. D. Whitwham, J. Boghen, and J. Herenguel. Rev. Aluminium No. 244, 13p. [(1958).] (In French)

The oxidation of Kroll zirconium in air was studied for the temperature range 400 to 1050°C, and for periods up to 24 hrs. Below 500°C, the thin oxide film remains compact, adherent, and protective. In contrast, for temperatures above 500°C, the expansion produced in the conversion of metal into oxide results in a deformation of the subjacent zone of metal: the metal-oxide interface develops undulations, while the oxide film loses its protection due to the formation of fissures. Deformation of the metal is especially visible at the edges. This effect does not depend either on the temperature or the thickness of metal, but in the particular case of thin sheets heated in the range 800 to 1000°C, the flow of metal causes a general increase in area in the plane of the sheet. This growth is accompanied by further fissuration of the oxide film, and slight cracking of the subjacent zone of metal (hardened by contamination with oxygen and nitrogen). It is suggested that this mechanism of interface flow put forward for zirconium, which evidently prevents any autoprotection, is probably applicable in other cases of oxidation. There must therefore exist a certain convergence between creep resistance and the possibility of autoprotection, a factor which needs to be taken into account in practice. (auth)

4512

QUANTITATIVE ANALYSIS, BY A SPECTROGRAPHIC METHOD, OF THE ISOTOPIC COMPOSITION OF HYDROGEN, DEUTERIUM AND TRITIUM MIXTURES. M. N. Oganov and A. R. Striganov. Spectrochim. Acta 13, 139-49(1958) Nov.

This paper was previously abstracted from the original language and appears in NSA, Vol. 12, as abstract No. 9027.

4513

THE PASSIVATION PROCESS IN THE PRESENCE OF THE XO_4^{n-} INHIBITORS. G. H. Cartledge (Oak Ridge National Lab., Tenn.). Z. Elektrochem. 62, No. 6-7 684-90(1958).

The behavior of several XO_4^{n-} ions and molecules with respect to the corrosion of iron and steel was studied. The results support the view that a competitive adsorption of the effective inhibitors is involved in their action and that their specificity derives from an internal difference other than precipitating power and ionic charge or configuration. It is proposed that this specificity depends upon a difference in the polarity of the X–O bonds, such that those particles in which the polarity and the valence of X are high exert an effective electrostatic polarization in the substrate. It was shown that the film formed on iron in an aerated inhibitor exhibits the Flade potential during activation by addition of an indifferent electrolyte. An electrode process corresponding to the Flade potential is suggested. The passivation process is discussed from the point of view of the relative rates of reduction of protons and oxygen, respectively, and the possible effect of electrostatic polarization upon these rates. Evidence is presented for considering the XO_4^{n-} particles to differ among themselves in the degree of polarity of the X–O bonds. It is shown that covalently and ionically bonded structures lead to very different electrostatic fields near the surface on which they are adsorbed, and the field of the polar particles is discussed with respect to its possible relation to inhibition and other phenomena dependent upon the kinetics of charged-particle transfer at interfaces. (auth)

4514

TRENDS IN X-RAY STRUCTURE ANALYSIS. Zavodskaya Lab. 24, No. 5, 519-43(1958). (In Russian)

A review is given of current trends, particularly in the applied field, in relation to techniques and apparatus as well as to the types of structure and kinds of material in which developments are taking place. (tr-auth)

4515

NEUTRON DIFFRACTION STUDIES ON METALS AND ALLOYS. B. G. Lyashchenko. Zavodskaya Lab. 24, No. 5, 585-97(1958). (In Russian)

The subjects reviewed are: crystallographic applications; plastic deformation mechanisms and textures; light atom positions; superlattices and complex intermetallic compounds; gases, liquids, and amorphous solids; graphite; application of magnetic scattering; transition metals; and atomic electron structures of transition metal solid solutions. (tr-auth)

4516

QUANTITATIVE X-RAY FLUORESCENCE DETERMINATION OF RARE EARTH ELEMENTS IN MINERALS AND CONCENTRATES. R. L. Barinskii. Zavodskaya Lab. 24, No. 5, 613-17(1958). (In Russian)

The L-series lines are used in a Johann vacuum spectrograph with a bent quartz crystal (radius 0.5m). The reproducibility is tested on fergusonite and loparite and found to be good. The results for artificial mixtures agree well with analytical data. (tr-auth)

4517

QUANTITATIVE X-RAY FLUORESCENCE ANALYSIS OF ORES AND MINERALS FOR U, Th, Pb, Ta, Hf, Nb, Zr, Y, AND Sr. K. I. Narbutt. Zavodskaya Lab. 24, No. 5, 617-19(1958). (In Russian)

A 1-m-radius bent quartz crystal is used on transmission (Narbutt spectrometer), the analyzer being a quartz crystal (reflection from the (1010) plane); dispersion 10 kX/mm (first order) L-series lines are used, except for Nb, Sr, and Y where K series lines are used. (tr-auth)

4518

QUANTITATIVE X-RAY FLUORSCENCE DETERMINATION OF Zr IN ORES. N. F. Losev. Zavodskaya Lab. 24, No. 5, 619-21(1958). (In Russian)

The Kα line (784.3 kX) is used with fine powders to determine Zr contents in concentrates from 0.6% up-

wards. The spectrometer used is not described. (tr-auth)

4519

INVESTIGATION OF THE KINETICS OF THE REACTIONS OF OXIDATICN, NITRIDATION, AND HYDRIDATION OF URANIUM. Yves Adda. Paris, Gauthier-Villars, 1958. 58p. Available from Centre d'Études Nucléaires, Saclay, France. (In French)

Various physico-chemical methods were used to investigate the kinetics of the oxidation, hydrogenation, and nitration of uranium. The experimental results show that the kinetics of these reactions are influenced by many factors. The Pilling and Bedworth rule is valid only under very limited conditions. The disagreement between this rule and the experimental results could be explained by the existence of numerous mechanical faults in the compounds obtained by the dry corrosion of the metal. (auth)

Radiation and Radiochemistry

4520 CEA-780

France. Commissariat à l'Énergie Atomique, Paris.
DÉTERMINATION DU ^{90}Sr DANS DES EAUX CHARGÉES EN CALCIUM. (Sr^{90} Determination in Calcareous Water.) P. Cohen, G. Pardo, and G. Wormser. 1958. 2p.

The Straub method (J. Am. Water Works Assoc., 336-40(1955) Apr.) for determination of radioactive strontium in water containing calcium is valid within very wide limits, and particularly in the case of residual water from the chemical purification treatment of the radioactive liquid effluent at the C.E.N., Saclay. (auth)

4521 HW-57670

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
CONSIDERATION OF THE PRESENT AND FUTURE MARKET FOR CESIUM-137. L. E. Brownell. Aug. 29, 1958. 75p. Contract [W-31-109-Eng-52]. $12.30(ph OTS); $4.50(mf OTS).

One of the primary problems in the consideration of the present and future market for cesium-137 is the pricing of this radioisotope. Based on present and probable future prices of cesium-137 and cobalt-60 for applications in which either radioisotope may be used, it is believed that cobalt-60 will be preferred to cesium-137 if the sources are to be sold and written off in about 5 years or less. On a rental basis (using an AEC write-off in 30 years) cesium-137 will be preferred. Present markets for cesium-137 sources are believed to exist in the following applications: teletherapy, industrial radiography, hospital radiosterilization of surgical supplies, commercial radiosterilization of bulk medical supplies, commercial sterilization of pharmaceuticals and medical specialties, promotion of chemical reactions, and research sources. A summary of the estimates of the present (1959) market for cesium-137 with the minimum and maximum curiages involved and with comments regarding the various applications is given. It is expected that these markets can be realized only as a result of aggressive promotion both by AEC and industry of cesium-137 and associated machines and equipment for using cesium-137. A large future market for cesium-137 is believed to exist primarily in the field of food processing with gamma radiation. Before this market becomes a reality the Food and Drug Administration must approve the use of gamma radiation as means of commercial processing of foods. Since sources for such applications will be in the multimegacurie range, the costs for the sources will be large, and the pricing of cesium-137 will be a most important consideration. It is believed that this market will develop by 1961. A summary of the estimates of future (1962) market for cesium-137 is given. (auth)

4522 NP-7074

Rochester, N. Y. Univ.
RADIOLYSIS OF CH_3COOCH_3 AND CH_3COOCD_3 BY COBALT-60 γ-RAYS. P. Ausloos and C. N. Trumbore. [1958]. 22p. Contract AF18(600)-1528.

Results of studies on the radiolysis of liquid and gaseous CH_3COOCH_3 and CH_3COOCD_3 by Co^{60} gamma radiation are reported. Yields of the volatile radiation decomposition products were studied as a function of temperature, dose, and the presence of added radical scavengers. A comparison of the isotopic hydrogen, methane, ethane, and dimethyl ether species present in these products provides information about possible primary processes, hot radical effects, and radical disproportionation and recombination reactions within the liquid cage. Recombination of methyl radicals originating from the same parent molecule as well as abstraction reactions between radicals in the same cage are postulated to explain the non-statistical yields of CH_3CD_3 and the high yields of CH_3D and CH_3OCD_3 in the liquid phase. (auth)

4523 NP-7126

Brussels. Centre d'Étude de l'Énergie Nucléaire.
PROGRAMME DE CONTROLE DE L'ACTIVITE DES ISOTOPES. (Program for Control of Activities of Isotopes.) F. Leroy. June 22, 1958. 16p.

Techniques to use in diluting and counting radioisotopes so as to minimize systematic errors are outlined. (T.R.H.)

4524 NP-7134

Brussels. Centre d'Étude de l'Énergie Nucléaire.
REACTIONS NUCLEAIRES, PREPARATION DES RADIOELEMENTS ARTIFICIELS ET APERCU DES POSSIBILITES D'APPLICATIONS. (Nuclear Reactions, Preparation of Artificial Radioelements and Survey of Possibilities of Application.) R. Constant. Jan. 15, 1958. 26p.

The physics of nuclear reactions is discussed in relation to production of radioisotopes. The uses of radioisotopes in science and industry are surveyed. (T.R.H.)

4525 UCRL-8369

California. Univ., Berkeley. Radiation Lab.
CHEMISTRY DIVISION SEMIANNUAL REPORT [FOR] DECEMBER 1957 THROUGH MAY 1958. July 14, 1958. 101p. Contract W-7405-eng-48. $2.50(OTS).

The excitation functions for some reactions of U^{238} with monoenergetic C^{12} ions have been measured by the use of the stacked-foil technique. The $(C^{12},4n)$ and $(C^{12},6n)$ reactions were found to occur through the formation of a compound nucleus followed by neutron evaporation. The excitation functions for the (α,n), $(\alpha,2n)$, $(\alpha,3n)$, $(\alpha,4n)$, (α,pn), and $(\alpha,p2n)$ reactions of the isotope Cf^{252} with 20- to 40-Mev He ions have been measured by use of the deflector-channel recoil assembly probe. The triton angular distributions corresponding to transitions to the ground states and measurable excited states of the product nuclei for the reactions $Al^{27}(\alpha,t)Si^{28}$ and $Fe^{56}(\alpha,t)Co^{57}$ were measured. The technique of recoil-energy measurements was developed by use of the reaction $Bi^{209}(\alpha,2n)At^{211}$. The reac-

tions $Bi^{209}(\alpha,3n)At^{210}$, $Bi^{209}(\alpha,4n)At^{209}$, and $Cm^{244}(\alpha,2n)Cf^{246}$ were studied. Total fission cross section curves are given for U bombarded with C^{12}, C^{13}, and Ne^{20}. Neutron branching ratios are given for Pu isotopes. Work was essentially completed on the study of the reactions $Ni^{58}(\alpha,\alpha n)Ni^{57}$, $Ni^{58}(\alpha,\alpha 2n)Ni^{56}$, $Ni^{58}(\alpha,\alpha p)Co^{57}$, and $Ni^{58}(\alpha,\alpha pn)Co^{56}$. The alpha spectrum of a sample of mixed californium isotopes containing Cf^{249}, Cf^{250}, Cf^{251}, and Cf^{252} was investigated. Md^{255} and Md^{256} were produced by bombardment of Es^{253} with He ions in the 60-in. cyclotron. The decay scheme of Pa^{233} is presented. The alpha-particle spectrum of Pa^{229} has been studied. Half-life measurements of two excited states of Dy^{161} were made. A series of bombardments with N^{14} ions on stable praseodymium has been carried out. Three alpha-particle emitters, Dy^{150}, Dy^{151}, and Dy^{152}, were produced. Decay schemes are given for the isomers of Tc^{95} and Tc^{97}. The investigation of neutron-deficient Sr isotopes by use of heavy-ion bombardment is presented. This study resulted in the discovery of the new nuclides Sr^{80} and Rb^{80}. Nuclear spins and magnetic moments are presented for Pa^{233}, Np^{238}, Np^{239}, Pu^{239}, Am^{241}, and Cm^{242}. Electronic ground states are presented for Ac, Th, Pa, U, Np, Pu, Am, and Cm. The spins and nuclear magnetic dipole and electric quadrupole moments of the radioactive halogens have been determined. The products formed in the radiolysis of cis and trans 1,2-dichloroethylenes with 40-Mev He ions are presented. The chemical properties of astatine are being studied. Fluorescent studies of Am and Cm in $LaCl_3$ matrix are described. (For preceding period see UCRL-8141.) (W.L.H.)

4526 WAPD-203

Westinghouse Electric Corp. Bettis Plant, Pittsburgh. A MATHEMATICAL DESCRIPTION OF ACTIVITY BUILD-UP IN THE PRIMARY COOLANT SYSTEM OF A PRESSURIZED WATER REACTOR RESULTING FROM THE ESCAPE OF CORE-CONTAINED FISSION PRODUCTS. B. D. O'Reilly. Sept. 1958. 28p. Contract AT-11-1-GEN-14. $1.00(OTS).

A formal mathematical description of the time dependence of activity in the primary coolant system of a pressurized water reactor resulting from the release of core-contained fission products is developed. Three functional forms are assumed for the rate of release of activity from core to coolant. They are: a source rate proportional to the quantity of activity in the core; a constant source rate; and an impulse. The description accounts for the deposition, re-solution, and demineralization of activities due to one, two, and three member mass chains. (auth)

4527 CEA-tr-R495

UTILISATION DES RADIOISOTOPES EN U.R.S.S. (Utilization of Radioisotopes in the U.S.S.R.) G. V. Kourdioumov, M. B. Neimane, and G. H. Frank. Translated from Atomnaya Energ. 3, 465-78(1957). 43p.

A review is presented of the uses of radioisotopes in the USSR. Uses in the fields of chemistry, biology and medicine, and agronomy are cited. 98 references. (T.R.H.)

4528 CEA-tr-R499

ETAT DE MICROQUANTITÉS DE RADIOÉLÉMENTS EN SOLUTION. IV. ETAT DE MICROQUANTITÉS D'URANIUM EN SOLUTION. (State of Microquantities of Radioelements in Solution. IV. State of Microquantities of Uranium in Solution.) I. E. Starik and L. B. Koliadine. Translated from Zhur. Neorg. Khim. 2, 1432-5(1957). 9p.

Data are given for absorption of U compounds on glass, SBS cation exchanger, and PE-9 anion exchanger at pH 2 to 10, starting with solutions 5×10^{-4} and 1×10^{-6} M in UO_2Cl_2. Ultrafiltration, electrophoresis, and centrifugation studies were conducted. The results show that at 5×10^{-4} M in the pH range 2.5 to 6.5, uranium forms a true colloidal solution, but at 10^{-6} M and pH 2.5 to 7.5 it forms a pseudo-colloid, as a result of adsorption on impurities found in the solution. (T.R.H.)

4529 CEA-tr-R557

SUR LES NOMBRES DE MASSE DES ISOTOPES DU TERBIUM DEFICIENTS EN NEUTRONS. (The Mass Numbers of Neutron-Deficient Terbium Isotopes.) V. I. Baranovskii (Baranovsky), A. N. Murin (Mourine), V. N. Pokrovskii (A. N. Prokrovsky), and I. A. Ytlandov (Ioutlandov). Translated from Izvest. Akad. Nauk S.S.S.R., Ser. Fiz. 22, 808-10(1958). 10p.

The short-lived spallation products of 660-Mev protons on Ta were studied to establish the branching Tb^{149} to Gd^{149}. The mass number of Tb^{149} having been established, the presence of this branching indicates that the value of A for Gd^{149} is equally exact. (T.R.H.)

4530 CEA-tr-X67

ETUDE SUR LA SÉPARATION DES PRODUITS DE FISSION. PRÉPARATION DE CÉSIUM RADIOACTIF EXEMPT. D'ENTRAÎNEUR. (Study on the Separation of Fission Products. Preparation of Radioactive Carrier-Free Cesium.) T. Siokawa and M. Yagi. Translated by S. S. Minn from Bunseki Kagaku 5, 220-1 (1956). 8p.

Radioactive Cs is separated from other fission products by coprecipitation, first with ammonium phosphotungstate, then with ammonium chloroplatinate. About 80% yield is obtained. (T.R.H.)

4531

RADIOCHEMICAL SEPARATION OF FISSION PRODUCTS FROM LARGE VOLUMES OF SEA WATER. STRONTIUM, CESIUM, CERIUM, AND PROMETHIUM. T. T. Sugihara, H. E. James, and E. J. Troianello (Clark Univ., Worcester, Mass.) and V. T. Bowen (Woods Hole Oceanographic Institution, Mass.). Anal. Chem. 31, 44-9(1959) Jan.

Chemical methods were used to isolate 28-year strontium-90, 30-year cesium-137, 280-day cerium-144, and 2.4-year promethium-147 from as much as 200 liters of sea water. Strontium separation involves precipitation of mixed strontium-calcium carbonates directly and in the presence of (ethylenedinitrilo)tetraacetate ion, precipitation of strontium nitrate, scavenging with ferric hydroxide–barium chromate, and conversion to strontium carbonate. Strontium-90 activity is measured by separating and counting the daughter yttrium-90 activity. Cesium is coprecipitated with dipotassium sodium cobaltinitrite, separated as cesium silicotungstate, converted to the perchlorate, and freed of trace potassium and rubidium by ion exchange. Rare earths are removed by initial coprecipitation on ferric hydroxide. Uranium, protactinium, and thorium are removed by ion exchange; radium and lead are scavenged with barium sulfate. The cerium fraction is obtained in pure form by separation as cerium(IV); promethium, by cation exchange. (auth)

4532

RADIOCHEMICAL DETERMINATION OF FISSION RUTHENIUM IN AQUEOUS SOLUTIONS. A NONDISTILLATION TECHNIQUE. R. R. Rickard and E. I.

Wyatt (Oak Ridge National Lab., Tenn.). Anal. Chem. 31, 50-1(1959) Jan.

A radiochemical method for the determination of fission ruthenium in aqueous solutions is described, which does not require distillation to effect radiochemical purity. The use of potassium periodate and sodium hypochlorite to retain ruthenium in an alkaline solution in the ruthenate and perruthenate state permits removal of many fission products from ruthenium by coprecipitation with zirconium hydroxide. The ease of dissolution of finely divided ruthenium metal with alkaline potassium periodate or sodium hypochlorite adds flexibility. Approximately 1 hour is required for an analysis in duplicate, with precision and accuracy comparable to the distillation method. (auth)

4533

THE EFFECTS OF α-PARTICLES ON AQUEOUS ACIDS. Z. V. Ershova and M. V. Vladimirova. Atomnaya Energ. 5, 546-9(1958). (In Russian)

The initial radiochemical yield of hydrogen peroxide in a wide range of plutonium solutions was found to be equal to 1.20 molecules per 100 ev of absorbed energy. The balanced final hydrogen peroxide concentrations in 0.8 N sulfuric acid is ~5 to 8×10^{18} molecules. (tr-auth)

4534

RADIOLYSIS OF TETRACHLOROETHYLENE. J. W. Sutherland and J. W. T. Spinks (Univ. of Saskatchewan, Saskatoon, Can.). Can. J. Chem. 37, 79-90(1959) Jan.

When tetrachloroethylene is irradiated with Co^{60} gamma rays in the presence of oxygen or air, the main products are trichloroacetyl chloride, phosgene, and oxalyl chloride. The reaction is a chain reaction. Possible reaction mechanisms are discussed. (auth)

4535

A FEW EXAMPLES OF THE APPLICATION OF THE SCINTILLATION γ-SPECTROMETER TO CHEMICAL ANALYSIS. P. Leveque, P. Martinelli, and S. May (Centre d'Etudes Nucléaires, Saclay, France). Intern. J. Appl. Radiation and Isotopes 4, 41-4(1958) Dec. (In French)

Analytical uses of gamma spectrometry and β-excited x-ray fluorescence are reviewed. (C.H.)

4536

EFFECT OF ADDITIVES ON THE RADIATION INDUCED POLYMERIZATION OF ISOBUTENE. R. Worrall (Tube Investments Research Labs., Hinxton, Eng.) and A. Charlesby (Royal Military Coll. of Science, Shrivenham, Berks, Eng.). Intern. J. Appl. Radiation and Isotopes 4, 84-8(1958) Dec.

The polymerization of certain monomers under the influence of high-energy radiation is believed to proceed by an ionic mechanism. The yield is found to be greatly increased in the presence of fine powders of some metallic oxides, such as zinc oxide and silica. It is reduced by the presence of polyethylene powder, in which radicals are produced by radiation. Data on the effect of zinc oxide concentration, dose, and radiation intensity are given. The increased yield is due to an increased initiation rate. (auth)

4537

A SURVEY OF CHEMICAL DOSIMETRIC SYSTEMS. Jerome Weiss (Brookhaven National Lab., Upton, N. Y.). Intern. J. Appl. Radiation and Isotopes 4, 89-95(1958) Dec.

This survey covers the literature published on chemical dosimetry for electrons and γ and x rays, during the past ten years. A brief discussion of ionization chamber measurements is given as well as the most recent values of W for various gases. The dosimeters listed include liquid, solid, and gaseous systems with brief comments concerning each. (auth)

4538

CONTRIBUTION TO THE STUDY OF THE PREPARATION OF CESIUM SOURCES. J. Trocker, C. Fisher, and A. Raggenbass (Commissariat à l'Energie Atomique, Paris). Intern. J. Appl. Radiation and Isotopes 4, 96-107(1958) Dec. (In French)

The manufacture of strong Cs^{137} sources is an operation which poses many problems. These include the choice of salt with regard to its good specific activity and its stability under radiation, and the preparation of this salt in suitable form, either by fusion or by pelleting. An investigation was made of volatilization when fusion is used as a means of preparing sources of the two most interesting salts, cesium chloride and cesium sulfate. Cesium sulfate was found to be more volatile than the chloride. Nevertheless, taking into consideration the volatilization of the two salts and the possibility of obtaining a higher density and thus specific activity by compression of the salts, the advantage of choosing compression as a method of encapsulation of the Cs^{137} salt is discussed. The manufacture of strong sources also raises the problem of self-absorption in the source. This factor was determined in the case of sources made up with cesium chloride and sulfate. (auth)

4539

ALL-GLASS APPARATUS FOR MICRO-SYNTHESIS OF RADIOACTIVE SOLIDS. P. C. Rajam and Margaret E. Wirgau (Univ. of Michigan Medical School, Ann Arbor) and U. M. Tsao (Univ. of Michigan, Ann Arbor). Intern. J. Appl. Radiation and Isotopes 4, 111-12(1958) Dec.

Design is described of an inexpensive all-glass apparatus for use in the synthesis of milligram amounts of radioactive organic compounds. The preparation of radioiodinated 2-amino-3,4-di-iodobenzoic acid, with a specific activity of 400 μc/mg, is described as an example of the use of the apparatus. An exploded view of the apparatus is included. (C.H.)

4540

AN AUTOMATIC SAMPLE CHANGER FOR WELL-TYPE SCINTILLATION COUNTERS. David V. Cohn, William E. Carter, and Richard Anderson (Veterans Administration Hospital, Kansas City, Kansas and Univ. of Kansas Medical School, Lawrence). Intern. J. Appl. Radiation and Isotopes 4, 118-21(1958) Dec.

A simple and reliable automatic sample changer for use with well-type scintillation counters was constructed. A maximum of 25 samples may be assayed at one time by placing them in special carrier assemblies which are then inserted in a turntable mounted above the counter. A moving platform engages each carrier assembly in turn and positions it in the well. Although designed to operate directly with, and without modification of, specific commercially-available equipment, its principle of operation permits it to be readily modified for use with other counters, scalers, or ratemeters. 3 figures. (auth)

4541

PHOTOCHEMISTRY OF NUCLEIC ACIDS AND RELATED COMPOUNDS. I. THE FIRST STEP IN THE ULTRAVIOLET IRRADIATION OF 1,3-DIMETHYLURACIL. Shih Yi Wang (Tufts Univ., Boston). J. Am. Chem. Soc. 80, 6196-8(1958) Dec. 5.

The first isolated product of the ultraviolet irradiation of 1,3-dimethyluracil was identified by synthesis as 6-hydroxyl-1,3-dimethylhydrouracil. 5-Hydroxy-1,3-dimethylhydrouracil was eliminated as a possible intermediate in this process. A mechanism for this process was proposed. (auth)

4542

PHOTOCHEMISTRY OF NUCLEIC ACIDS AND RELATED COMPOUNDS. II. THE ULTRAVIOLET IRRADIATION OF THE FIRST PRODUCT FROM 1,3-DIMETHYLURACIL. Shih Yi Wang (Tufts Univ., Boston). J. Am. Chem. Soc. 80, 6199-6201(1958) Dec. 5.

The effects of ultraviolet irradiation on 6-hydroxy-1,3-dimethylhydrouracil resulted in the formation of N,N′-dimethylmalonamide via 1,3-dimethylbarbituric acid. The irradiation reaction sequence was investigated. The kinetics were studied, and the mechanisms were discussed. (auth)

4543

ELECTROPHILIC HYDROGEN ISOTOPE SUBSTITUTIONS. I. BENZENE AND TOLUENE. Walter M. Lauer, Gale W. Matson, and Geoffrey Stedman (Univ. of Minnesota, Minneapolis). J. Am. Chem. Soc. 80, 6433-7(1958) Dec. 5.

The initial rates of deuteration of benzene and toluene in deuterium oxide and trifluoroacetic acid mixtures have been measured, and the isomer distribution of the deuterium substituted in the toluene determined. The partial rate factors found were $o_f = 250$, $m_f = 4$, $p_f = 420$. Methods for checking these partial rate factors are described. The results are compared with those for other electrophilic aromatic substitution reactions. (auth)

4544

HYDROGEN ISOTOPE EXCHANGE REACTIONS. II. MONOALKYLBENZENES. Walter M. Lauer, Gale W. Matson, and Geoffrey Stedman (Univ. of Minnesota, Minneapolis). J. Am. Chem. Soc. 80, 6437-9(1958) Dec. 5.

The relative rates of deuteration of a number of monoalkylbenzenes in mixtures of trifluoroacetic acid and deuterium oxide have been measured by several methods and the isomer distribution determined. All the alkyl groups studied have very similar reactivities and the ortho–para ratio does not decrease greatly between toluene and t-butylbenzene. It appears that steric effects are small in this reaction. (auth)

4545

ELECTROPHILIC HYDROGEN ISOTOPE SUBSTITUTIONS. III. THE POLYALKYLBENZENES. Walter M. Lauer and Geoffrey Stedman (Univ. of Minnesota, Minneapolis). J. Am. Chem. Soc. 80, 6439-41(1958) Dec. 5.

The rates of deuteration of a number of polyalkylbenzenes in mixtures of deuterium oxide and trifluoroacetic acid have been measured. The rate of exchange closely parallels the basicity of the hydrocarbon and can be predicted from the partial rate factors for the deuteration of the monoalkylbenzenes. The results provide further evidence that steric effects are small for deuteration in trifluoroacetic acid and give approximate values for the meta partial rate factor for several alkyl groups. (auth)

4546

RADIOLYSIS OF LIQUID BROMINE TRIFLUORIDE. S. J. Yosim (Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.). J. Phys. Chem. 62, 1596-7(1958) Dec.

In scanning experiments a red coloration was observed when BrF_3 was irradiated with 1-Mev electrons. Fractional distillation of the irradiated liquid showed one of the products to be BrF_5, a colorless liquid boiling at 42°C. A second fraction was a red liquid boiling at 34°C which was proved to be a Br_2–BrF_5 azeotrope with an F/Br ratio of 2.6. This was established by fractionally distilling synthetic binary mixtures of the Br_2–BrF_3–BrF_5 system and determining the boiling points and F/Br ratios of the separated fractions. (W.L.H.)

4547

NOTE ON RADIATION-INDUCED EXCHANGE OF HYDROGEN. S. C. Lind (Oak Ridge National Lab., Tenn.). J. Phys. Chem. 62, 1601(1958) Dec.

The influence of ions of inert gases on the radiation-induced reaction $H_2 + D_2 = 2HD$ is discussed. (W.L.H.)

4548

A MODIFIED PROCEDURE FOR THE OXIDATION OF RADIOCARBON COMPOUNDS. P. K. Bhattacharyya (National Chemical Lab., Poona, India). J. Sci. Ind. Research (India) 17B, 467-70(1958) Nov.

A simple apparatus for carrying out oxidations of radioactive organic samples for radioactivity determinations is described. The traces of sulfur trioxide in the gases produced as a result of oxidation of the samples are removed by bubbling the gases through a mixture of sulfuric acid and dichromate. The carbon dioxide is efficiently absorbed in a small volume of alkali in a special type of bubbler. (auth)

4549

DYNAMIC MECHANICAL PROPERTIES OF IRRADIATED POLYETHYLENE. E. Butta and A. Charlesby (Univ. of Pisa, Italy and Tube Investments Research Labs., Hinxton Hall, Eng.). J. Polymer Sci. 33, 119-28(1958) Dec.

Dynamic mechanical properties of eight samples of polyethylene irradiated to various extents have been determined over a temperature range from −70 to +280°C and a frequency range from 10^3 to 2×10^4 cycles/sec. At room temperature, minimum values in Young's modulus and maximum values in damping factor are observed for a critical radiation dose. Three transition points T_g, T_s, and T_m are exhibited by the sound velocity-temperature curves; these may be associated with the transition from the glass state, the softening of the amorphous regions, and the melting of the crystallites, respectively. With increasing dose, T_m decreases and T_g increases, while T_s shows a minimum for a radiation dose equal to the critical value. At temperature above the melting point of the crystallites T_m, lightly crosslinked samples show rubber-like elasticity, but highly crosslinked samples show the same dynamic mechanical behavior as highly crosslinked amorphous materials. Results are discussed and explained on the basis of the partial crystallinity of polyethylene and of the changes that irradiation causes on the molecular structure. (auth)

4550

PARAMAGNETIC RESONANCE STUDY OF IRRADIATION DAMAGE IN CRYSTALLINE CARBOHYDRATES. Dudley Williams, J. E. Geusic, M. L. Wolfrom, and Leo J. McCabe (Ohio State Univ., Columbus). Proc. Natl. Acad. Sci. U. S. 44, 1128-36(1958) Nov.

Principles of paramagnetic resonance determinations are reviewed. Results are reported from electron paramagnetic resonance studies of radiation damage in 16 carbohydrates following exposure of powder samples to x radiation or cathode-ray irradiation. In most of the irradiated carbohydrates studied the existence of hyperfine structure in the paramagnetic resonance spectrum suggests the general nature of the radical produced by the radiation. Applications of results in identifying radicals formed by ionizing irradiation are discussed. (C.H.)

4551

KRISTALLOKHIMIYA PROSTEYSHIKH SOYEDINENIY URANA, TORIYA, PLUTONIYA I NEPTUNIYA. (Crystal Chemistry of Simple Compounds of Uranium, Thorium, Plutonium, and Neptunium.) Yevgenii Sergeyevich Makarov. Moscow, Izd-vo AN SSSR, 1958. 141p.

A compilation is presented of the published data up to 1957 on the crystal chemistry of simple compounds of the actinide elements. An introductory chapter discusses some problems of general crystal chemistry. The crystal structure of polymorphous modifications of thorium, uranium, neptunium, and plutonium is described, and then the crystal structure of simple compounds with non-metals and metals is reported. The atomic radii of actinides in crystals are considered. The final chapter is a discussion of the dual chemical nature of thorium, uranium, neptunium, and plutonium. 117 references. (TCO-J.S.R.)

Separation Processes for Pu and U

4552 CEA-764

France. Commissariat à l'Énergie Atomique, Paris.
L'USINE-PILOTE DE CHATILLON. RÉSULTATS D'EXPLOITATION. (The Plutonium Extraction Pilot Plant at Chatillon.) P. Faugeras and P. Regnaut. 1958. 33p.

After a brief recapitulation of the problem and its difficulties, the chemical process and the apparatus used are described. The results obtained at the various stages of the separation are then given, as well as the performance by the apparatus. (auth)

4553 CEA-791

France. Commissariat à l'Énergie Atomique, Paris.
PREPARATION DE PLUTONIUM HEXAVALENT ET DOSAGE EN PRESENCE DE PLUTONIUM TETRAVALENT. (Preparation of Hexavalent Plutonium and Its Determination in the Presence of Tetravalent Plutonium.) C. Ferradini and J. Corpel. Feb. 1958. 6p.

In order to study the eventual reduction of plutonium from the VI-valent state to the IV-valent state, in sulfuric medium under the influence of its own α radiation or of the γ rays from a cobalt-60 source, a method for preparing pure hexavalent plutonium and two methods for analyzing solutions containing tetravalent and hexavalent plutonium simultaneously were developed. Hexavalent plutonium was prepared by anodic oxidation at a platinum electrode. Study of the oxidation yield as a function of various factors made it possible to define experimental conditions giving complete oxidation. For concentrations in total plutonium greater than 1.5×10^{-3} M, determination of the two valences, IV and VI, was carried out by spectrophotometry at two wavelengths. For lower concentrations, the determination was done by counting, after separation of the tetravalent plutonium in the form of fluoride in the presence of a carrier. (auth)

4554 CF-57-11-77

Oak Ridge National Lab., Tenn.
DAREX FLOWSHEET (BATCH OPERATIONS) PARTS V AND VI, SOLVENT EXTRACTION. J. R. Flanary and J. H. Goode. Nov. 5, 1957. Decl. Dec. 10, 1958. 6p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

Parts V and VI, two cycles of solvent extraction with an intercycle evaporation, of the Darex flowsheet are presented. Part V, the first cycle, was tested with both unirradiated material and with irradiated specimens at activity levels up to approximately 10% of that expected for an actual process. Decontamination factors were obtained using the first cycle solvent extraction flowsheet in mini-mixer-settlers. Part VI represents an extension of the second solvent extraction cycle of the 25-TBP Process, as applied to enriched uranium–stainless steel fuels. Since the product of the first cycle is free of stainless steel contaminants, application of the second cycle of a fully-developed process was considered adequate. (auth)

4555 CF-58-12-124

Oak Ridge National Lab., Tenn.
UNITED STATES ATOMIC ENERGY COMMISSION ASSISTANCE PROGRAM TO THE EUROCHEMIC COMPANY, MOL, BELGIUM. E. M. Shank. Dec. 31, 1958. 25p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70 (mf OTS).

The United States Atomic Energy Commission program of assistance to the European Company for the Chemical Processing of Irradiated Fuels ("Eurochemic"), Mol, Belgium, is presented. Included are: background, formation, purpose, and structure of the Company; basic design considerations and a brief description of the proposed plant; present status of the design; the AEC assistance authority and procedure; tabulation of the assistance required by Eurochemic; and a list of participating organizations and members. (auth)

4556 NP-7124

Brussels. Centre d'Étude de l'Énergie Nucléaire.
LES PROCEDES AQUEUX ET NON AQUEUX DE RETRAITEMENT DE L'URANIUM. (The Aqueous and Non-aqueous Processes for Retreatment of Uranium.) J. Schmets. June 16, 1958. 4p.

The pyrometallurgical, solvent extraction, and volatility processes for treatment of spent fuel elements are compared. (T.R.H.)

4557 ORNL-2554

Oak Ridge National Lab., Tenn.
DEVELOPMENT OF THE EXCER PROCESS V: RECOVERY, PURIFICATION, AND IRON REDUCTION OF URANIUM USING A SULFATE ION EXCHANGE SYSTEM. R. R. Holcomb and I. R. Higgins. Jan. 27, 1959. 41p. Contract W-7405-eng-26. $1.25(OTS).

A uranium sulfate process flowsheet for the production of UF_4 from sulfate ore leach liquors is presented. The uranium is sorbed on an anion-exchange resin from 0.2 M sulfate ore leach and eluted with 2 M H_2SO_4. Iron powder reduces UO_2SO_4 to $U(SO_4)_2$ which is then sorbed on anion-exchange resin to separate it from the iron and eluted from the anion-exchange resin with 2 M H_2SO_4. The resulting $U(SO_4)_2$ is sorbed on a cation-exchange resin from the H_2SO_4 solution and eluted from the resin with 5 to 6 M HCl. The UCl_4 thus produced may be treated with stoichiometric amounts of HF in order to precipitate $UF_4 \cdot \frac{3}{4}H_2O$. (auth)

4558

DETERMINATION OF URANIUM BY CUPFERRON WITH COMPLEXONE III AS THE MASKING AGENT. A. K. Majumdar and J. B. Ray Chowdhury (Jadavpur Univ., Calcutta). Anal. Chem. Acta 19, 576-7(1958) Dec.

At a pH between 4 and 6, hexavalent uranium is quantitatively precipitated by cupferron in the presence of complexone III and thus can be separated from Bi^{3+}, Cu^{2+}, Fe^{3+}, Cr^{3+}, Al^{3+}, Th^{4+}, Cd^{2+}, Pb^{2+}, Zn^{2+}, Mn^{2+}, Ni^{2+}, Co^{2+}, alkali metals, alkaline earth metals, rare earth metals, VO_3^-, MoO_4^{2-}, and WO_4^{2-}. (auth)

4559

THE EFFECTS OF MONO- AND DIBUTYL PHOSPHATES ON THE TRIBUTYL PHOSPHATE EXTRACTION OF Pu. V. B. Shevchenko and V. S. Smelov. Atomnaya Energ. 5, 542-5(1958). (In Russian)

Coefficients of mono- and dibutyl phosphate distributions between the organic and aqueous phases were determined. It is shown that monobutyl phosphate concentrations below 0.001 mole/liter (balanced concentration) and dibutyl phosphates below 0.0001 mole/liter have no effect on the plutonium extraction by tributyl phosphates. (tr-auth)

4560

PROCESSING OF MONAZITE SANDS. John Barghusen, Jr. and Morton Smutz (Iowa State Coll., Ames). Ind. Eng. Chem. 50, 1754-5(1958) Dec.

A solvent extraction process is described for separating Th, U, and rare earths from monazite sands. Thorium purification involves coextraction of cerium and thorium; the cerium value is recovered concurrent with thorium. The anion exchange techniques for recovery of U are advantageous to solvent extraction methods, as anion exchange inherently avoids cation contamination and gives generally higher recovery. The over-all significance of the process is that thorium, uranium, and rare earths are recovered in both high yield and purity. (W.L.H.)

4561

RECOVERY OF ENRICHED URANIUM FROM URANIUM DIOXIDE-STAINLESS STEEL FUEL ELEMENTS BY SOLVENT EXTRACTION. J. R. Flanary and J. H. Goode (Oak Ridge National Lab., Tenn.). Ind. Eng. Chem. 51, 23-6(1959) Jan.

Laboratory studies of the batch Darex dissolution process, as applied to prototype APPR fuel, followed by continuous solvent extraction have yielded chemical flowsheets which provide excellent uranium recovery and decontamination from fission products and inert impurities. The advantages of the process include rapid dissolution of stainless steel-containing fuels, hydrogen-free off-gas, and relatively high throughput. The principal disadvantages are corrosion and the carry-through of inert metals with limited solubility to the radioactive waste storage system. (auth)

4562

PLUTONIUM PEROXIDE PRECIPITATION. J. A. Leary, A. N. Morgan, and W. J. Maraman (Los Alamos Scientific Lab., N. Mex.). Ind. Eng. Chem. 51, 27-31 (1959) Jan.

Precipitation of the hexagonal structure of plutonium peroxide is an excellent concentration and purification step in plutonium metal preparation. Formation of an undesirable cubic structure is avoided by proper control of process variables. (auth)

4563

POLYMERIZATION AND PRECIPITATION OF PLUTONIUM(IV) IN NITRIC ACID. Arthur Brunstad (General Electric Co., Richland, Wash.). Ind. Eng. Chem. 51, 38-40(1959) Jan. 1.

The formation of colloidal plutonium(IV) hydroxide from plutonium(IV) nitrate solutions was determined as a function of acid and plutonium concentration at several temperatures. Hydrolysis, polymerization, and precipitation take place in unstable solutions with a resulting increase in acidity to a concentration sufficient for a stable true solution. Except for colloidal sols formed from solutions of a few grams per liter, the acidities become too high for the plutonium to remain as a stable colloid. (auth)

4564

RECOVERY AND PURIFICATION OF PLUTONIUM BY ANION EXCHANGE. J. L. Ryan and E. J. Wheelwright (General Electric Co., Richland, Wash.). Ind. Eng. Chem. 51, 60-5(1959) Jan.

Results to date indicate that plutonium can be absorbed at a reasonably rapid rate on any of several commercially available anion exchange resins from 7M nitric acid at 60°C. When the plutonium-loaded resin is then washed with 7M nitric acid, very high factors are obtained for separation of plutonium from uranium, fission products, and common ionic and nonionic impurities. The degree of separation depends on the extent of the washing cycle. Fission product separation factors as high as 3×10^7 have been obtained in two cycles of anion exchange. Uranium separation factors of comparable magnitude are possible with moderate volumes of wash solution. Product concentrations of greater than 50 grams of plutonium per liter are obtainable by eluting with dilute nitric acid at elevated temperature. Several resins show adequate resistance to chemical and radiation damage. Of the resins studied, Permutit SK shows the best combination of operating characteristics. Chemical and radiation stability and elution characteristics are outstanding. (auth)

4565

PROCESSING-REFABRICATION OF METALLIC-URANIUM FUEL. D. I. Sinizer, K. L. Mattern, J. R. Foltz, and E. G. Kendall (North American Aviation, Inc., Canoga Park, Calif.). Nucleonics 17, No. 1, 50-3(1959) Jan.

Information is presented on the Processing-Refabrication Experiment (PRE) facility for the low-decontamination processing of irradiated uranium fuels. Discussions are included on: equipment development; maintenance and repair; and oxide drossing, a pyrometallurgical method for partial removal of fission products from irradiated metallic-uranium fuel. A schematic is shown of the PRE low-decontamination process. (J.H.M.)

4566

SEPARATION AND PURIFICATION OF MATERIALS. Rolt Hammond. New York, Philosophical Library, 1958. 332p.

The first section discusses the separation of solids by a large number of methods. The next two sections describe the separation of solids from gases and liquid by a number of different methods. The fourth section is devoted to the separation of various systems by distillation. The fifth section discusses the separation of various systems by centrifugation. The next section describes various methods for the separation of gases.

The last section describes purification and separation methods used in nuclear engineering. (W.L.H.)

CONTROLLED THERMONUCLEAR PROCESSES

4567 AECD-3747
Princeton Univ., N. J. Project Matterhorn.
PRELIMINARY DESIGN FOR THE STELLARATOR. PART I. FIELD WINDING. PART II. VACUUM CHAMBER AND SUPPORTING FRAME. Technical Memorandum No. 1. Clodius H. Willis. [195?]. Decl. Aug. 21, 1958. 25p. $4.80(ph OTS); $2.70(mf OTS).

4568 AECD-3748
Princeton Univ., N. J. Project Matterhorn.
LOCATION OF ORBITAL AXIS IN TABLE-TOP STELLARATOR. Technical Memorandum No. 2. Lyman Spitzer, Jr. June 9, 1952. Decl. Aug. 21, 1958. 4p. $1.80(ph OTS); $1.80(mf OTS).

It may be shown that for electrons with particular values of u and w, velocities parallel and perpendicular to the magnetic field, there is one particular orbit around the stellarator which is closed in a single revolution, i.e., there is one orbit such that the guiding center of the electron returns exactly to its former position after one revolution around the stellarator. This closed orbit is called an "orbital axis." Under certain ideal conditions the orbital axis will be the same for all values of u and w and will lie at the center of the tube. Actually, imperfections of the magnetic field, the presence of external fields, the changing curvature of the field, and the drift of particles across the field each produce a shift of an orbital axis relative to the center of the tube. The magnitude of these effects is investigated. (auth)

4569 AECD-3749
Princeton Univ., N. J. Project Matterhorn.
EFFECT OF PLASMA OSCILLATIONS ON THE TABLE-TOP MODEL. Technical Memorandum No. 3. Lyman Spitzer, Jr. July 31, 1952. Decl. Aug. 21, 1958. 5p. $1.80(ph OTS); $1.80(mf OTS).

If the plasma remains quiescent in the table-top model, nearly complete ionization should be reached. However, if oscillations break out, the electrons and positive ions may move to the wall under the influence of randomly varying electrostatic fields. If the time t_w taken to reach the wall is less than the multiplication time t_m required for the electron density to e-fold (if the plasma were quiescent), then the electron density will not increase at all. The probable magnitude of these quantities is investigated. (auth)

4570 CF-55-10-51
Oak Ridge National Lab., Tenn.
AN INVESTIGATION OF THE STABILITY OF A PLASMA: STEADY STATE CONFIGURATIONS WITH MASS ROTATION. R. C. F. Bartels. Oct. 14, 1955. Decl. Oct. 20, 1958. 42p. Contract [W-7405-eng-26]. $7.80(ph OTS); $3.30(mf OTS).

A report on an investigation of the stability of steady-state equilibrium configurations of a moving plasma is presented. The geometrical configuration of the cases considered is that in which the plasma is contained within a circular cylinder of finite radius. The motion which the plasma is permitted to have is that of rotation about the axis of the cylinder. It is supposed in all cases that the containment of the plasma is by means of a magnetic field which in turn is produced by an electric current flowing in the plasma parallel to the axis of the cylinder. The conductivity of the plasma is assumed to be infinite. The steady-state equilibrium configurations are examples of the electromagnetic pinching of a plasma column. A particular case of this pinch effect has already been examined by Kruskal and Schwarzschild and was found to be unstable. However, in their treatment the plasma is assumed to be stationary in its steady-state configuration. In the present treatment the plasma is permitted to rotate about the axis of the cylinder. The rotation of the plasma has a stabilizing effect on the pinch. (auth)

4571 LA-2131
Los Alamos Scientific Lab., N. Mex.
MAGNETIC FIELD DISTRIBUTIONS IN A PINCHED DISCHARGE. L. C. Burkhardt, R. H. Lovberg, and J. A. Phillips. Nov. 20, 1956. Decl. Jan. 8, 1959. 26p. Contract W-7405-ENG-36. $4.80(ph OTS); $2.70(mf OTS).

By use of small magnetic probes inserted into the discharge, the magnetic field distributions in the interior of a high-power pinched discharge were measured as a function of time. From these data the current distributions can be deduced. By applying a static pressure calculation, in the cases when the radial pinch accelerations are small, the plasma pressure in the pinch was determined, with superimposed axial magnetic fields, and for stable and unstable configurations. (auth)

4572 LA-2149
Los Alamos Scientific Lab., N. Mex.
STABILITY OF A LINEAR PINCH WITH A THICK BOUNDARY. B. R. Suydam. Aug. 1957. Decl. Jan. 8, 1959. 17p. Contract W-7405-ENG-36. $3.30(ph OTS); $2.40(mf OTS).

The stability of a linear pinch is investigated by means of the "δW" formalism. It turns out that when attention is confined to the surface layers of the plasma, convenient stability criteria can be deduced for very general cylindrically symmetric distributions of magnetic field and plasma; essentially $\overline{B}$ and p need merely be continuous through the plasma boundary. The criteria are found as inequalities which involve only the pressure gradient, the magnitude of the B_z-field component, and the torsion of the field at the plasma surface. (auth)

4573 NYO-6049
Princeton Univ., N. J. Project Matterhorn.
ORIENTATION LECTURES BY LYMAN SPITZER, JR. Edward A. Frieman. Sept. 24, 1954. Decl. Oct. 20, 1958. 49p. (PM-S-16). $7.80(ph OTS); $3.30(mf OTS).

Texts are given of lectures on various phases of thermonuclear reactors. The topics discussed include the characteristics of reactions which can take place in such a reactor, the theory of plasma confinement by a magnetic field with particular emphasis being placed on the theory of confinement in stellarators, the pinch effect, problems in raising a gas to high temperatures, and the design of specific systems such as the Perhapsatron, stellarators, and the magnetic mirror. (J.E.D.)

4574 NYO-6366
Princeton Univ., N. J. Project Matterhorn.
AN INVESTIGATION OF THE EFFECT OF A KOVAR RING ON A UNIFORM MAGNETIC FIELD. Technical

Memorandum No. 21. Kenneth E. Wakefield. [1958]. Decl. Aug. 21, 1958. 15p. $3.30(ph OTS); $2.40(mf OTS).

Kovar has been suggested as a glass-to-metal seal in the glass vacuum system of certain stellarator models. One proposed seal would consist of a Kovar ring two inches in diameter, one-half inch long, and 0.020 inch thick and would join a glass tube to a nonmagnetic stainless steel flange. The effects of uniform applied fields, in which the direction of the field was parallel to the axis of the ring, were investigated. The results show that for applied fields less than 5,000 oersteds the magnetic field is distorted an appreciable amount by the Kovar. The maximum distortion occurs when the applied field is between 20 and 200 oersteds, over which range the field pattern does not change significantly. In the absence of an applied field the Kovar ring is a very weak permanent magnet, producing field intensities comparable to the earth's field. (A.C.)

4575 NYO-7900

Princeton Univ., N. J. Project Matterhorn.
APPRAISAL OF POSSIBLE STELLARATOR BLANKET SYSTEMS. Ernest F. Johnson. Sept. 20, 1957. Decl. Sept. 22, 1958. 28p. (PM-S-30). $4.80(ph OTS); $2.70 (mf OTS).

A variety of systems for blanketing stellarators are considered from the standpoint of the practical problems of handling materials and recovering tritium. One of the most promising possibilities among these systems is the combination of water as moderator and molten lithium nitrite as absorber. Both fluids in this system are noncorrosive and can be pumped inexpensively in magnetic fields. Tritium loss due to neutron absorption by the nitrogen in the nitrite is small and can be made up by small amounts of beryllium in the blanket, or it can be reduced greatly by substituting Li^6 for natural Li in the nitrite. The tritium would be generated as gaseous compounds with nitrogen and oxygen and should be easily recoverable in yields in excess of 99.9%. A simple cost study of an idealized recovery system indicates that the total installed plant cost for tritium recovery should be well under $1,200,000, and the annual operating costs should not exceed $400,000. The initial total accumulation of tritium in a blanket containing 10^5 kg lithium could be less than 1.0 kg. (auth)

4576 NYO-7992

Princeton Univ., N. J. Project Matterhorn.
QUALITATIVE DESCRIPTION OF THE BEHAVIOR OF ψ SURFACES FOR A 3-WIRE HELIX TOGETHER WITH A UNIFORM AXIAL MAGNETIC FIELD, ALL IN VACUO. Technical Memo No. 53. George Backus. Sept. 16, 1957. Decl. Aug. 22, 1958. 18p. $3.30(ph OTS); $2.40 (mf OTS).

4577 UCRL-3468

California. Univ., Berkeley. Radiation Lab.
LINEAR PINCH WORK IN BERKELEY. O. A. Anderson and W. R. Baker. July 1956. Decl. Sept. 30, 1958. 13p. Contract W-7405-eng-48. $3.30(ph OTS); $2.40 (mf OTS).

Experiments conducted with the linear pinch have disclosed more factors in the mechanics of this phenomenon. The addition of a magnetic field parallel to the pinch axis modifies the pinch characteristics and notably affects the instabilities. An effective diagnostic tool, the Z-field pickup loop, has been introduced. Photographs of the breakup of the pinch with Z field indicate a corkscrew instability as predicted from Z-loop data. Insulator hang-up has been encountered with a system driven by a water-dielectric capacitor, and a simple solution for the problem has been found. (auth)

4578 UCRL-4479

California. Univ., Livermore. Radiation Lab.
PROPOSAL FOR A HIGH-CURRENT DISCHARGE TUBE WITH CAPACITOR. Winston H. Bostick. Mar. 18, 1955. Decl. Dec. 29, 1958. 18p. Contract W-7405-eng-48. $3.30(ph OTS); $2.40(mf OTS).

A parallel-plate capacitor and the discharge tube with which it is hoped that implosion energies of 4000 ev can be given to deuterons by the pinch effect are described. The discharge tube is to be arranged so that no external series switch is required. (auth)

4579 UCRL-4544

California. Univ., Livermore. Radiation Lab.
DESIGN AND FABRICATION OF SOLENOIDS FOR HIGH MAGNETIC FIELDS. Frederic Coensgen, Oliver S. Turpen, Jr., David R. Bramm, Robert B. Meuser, Reginald W. Rhein, and Norris W. Carlson. Dec. 1955. Decl. Dec. 29, 1958. 51p. Contract W-7405-eng-48. $7.80(ph OTS); $3.30(mf OTS).

This report consist of papers presented at a meeting held in late 1954 to review all the work related to coil design and fabrication. An illustrated detailed construction account of the first successful magnet built for Table Top I is given. Methods and materials for fabrication of high-field magnets are studied as a result of a small-coil test program. A tensile strength of 60,000 psi and a dielectric strength of 125 v/mil were found to be suitable design values for the glass and plastic material produced. A large number of tests performed by the field engineers are recorded. Methods are outlined for stress calculations in coils, particularly for the case where the coil windings are supported by an external shell composed of plastic and reinforcement. Specifications of fiberglas and resin materials are described briefly, and advantages and disadvantages of vacuum impregnation vs. wetlay methods for coil construction are discussed. (auth)

4580 UCRL-4671

California. Univ., [Livermore]. Radiation Lab.
THE PHOTODISSOCIATION OF H_2^+. Gordon Gibson. Apr. 4, 1956. Decl. Nov. 25, 1958. 18p. $3.30(ph OTS); $2.40(mf OTS).

The collisional breakup of molecules which are injected at high energies into the central region of a d-c mirror field geometry provides a possible means of trapping a plasma. Another breakup scheme which is discussed is the photodissociation of molecular ions. The photodissociation of the molecular hydrogen ion, H_2^+, is examined. The source of H_2^+, is examined. The source of H_2^+ which is considered is an arc where H_2^+ is formed as a result of collisions of electrons with molecular hydrogen, H_2. The H_2^+ is then accelerated and sent into a confining magnetic field, where it may absorb a photon and be dissociated by an electronic transition to an unstable state. (W.D.M.)

4581 UCRL-5015

California. Univ., Livermore. Radiation Lab.
CYCLOTRON RESONANCE HEATING OF A DEUTERIUM PLASMA. Edmund S. Chambers, William A. S. Lamb, and Dean O. Kippenhan. Oct. 28, 1957. Decl. Jan. 6, 1959. 28p. Contract W-7405-eng-48. $4.80(ph OTS); $2.70(mf OTS).

The energy gained by a deuterium plasma, from a

three megacycle per second radiofrequency field, was studied experimentally. A static magnetic field, in the form of a "mirror," was used. The coil of an r-f resonant circuit placed at the center of the machine produced a time-varying magnetic field parallel to the static field. This, in turn, induced an electrical field, in an azimuthal direction, which acted on the ions. When this was in synchronism with the cyclotron frequency, the ions could pick up energy. At this resonance the light intensity from the plasma increased markedly. This effect was used as evidence for the transfer of energy to the ions. (auth)

4582 UCRL-5284

California. Univ., Livermore. Radiation Lab.
DEVELOPMENT OF SWITCHING COMPONENTS FOR CONTROLLED FUSION RESEARCH. David B. Cummings. June 1958. 20p. Contract W-7405-eng-48. $3.30(ph OTS); $2.40(mf OTS).

Components for switching large stored energies are under development at the University of California Radiation Laboratory at Livermore. Applications and problems are discussed. Work was done on a low-inductance ignitron. A test and development program of ignitrons led to a tube good at 10 kv for pulses of 30 ka with a decay time of 500 μs. Times for transfer of the arc to the wall were measured for several types of ignitrons. A 4 in. insulated cathode ignitron was developed for pulses of 10 ka for 20 ms. The firing delay and jitter of 2 in. ignitrons were found to be as low as 0.25 μs and 0.06 μs, respectively. (auth)

4583 AEC-tr-3492

FREE OSCILLATIONS OF AN ELECTRON PLASMA IN A MAGNETIC FIELD. A. I. Akhiezer and L. E. Pargamanik. Translated by David Franklin from Uchenye Zapiski, Khar'kov. Gosudarst. Univ. im. A. M. Gor'kogo 25, 75-104(1948).

If an electron plasma, not subjected to external influences, is removed from a state of equilibrium, the process of relaxation is accomplished by damped oscillations of density being propagated in the plasma and the damped longitudinal electromagnetic oscillations associated with them. The influence of a constant homogeneous magnetic field applied to a plasma on the free oscillations of the plasma is reported. (L.T.W.)

4584 CEA-tr-R375

RÉPARTITION DE LA TEMPÉRATURE DANS LE PLASMA DE DÉCHARGES D'ÉTINCELLES À HAUTE ET BASSE TENSION. (Temperature Distribution in a Spark Discharge Plasma at High and Low Voltage.) D. B. Gurevitch (Gourevitch) and V. K. Prokof'ev (Prokofiev). Translated by B. Vinogradoff from Optika i Spektroskopiya 2, 417-20(1957). 11p.

The apparatus used in these experiments consisted of a spectroscope with a diffraction grating, a system of slits equipped with photomultipliers, and a two-channel recording oscillograph. To facilitate the discrimination of plasma zones, the iron electrodes were placed so that the spark would be horizontal and its image would be projected on the plane of the spectroscope slit. The temperatures were measured using Cu(I) lines at 5106 and 5153 A, and N(II) lines at 5045 and 5179 A. Temperatures were measured at 10^{-5} sec intervals for a discharge of several hundred microseconds both for low and high voltages. The results show that the different zones of the plasma have very different temperatures, even at a given instant. (T.R.H.)

4585

WORK ON CONTROLLED THERMONUCLEAR REACTIONS IN THE USSR. L. A. Artsimovich. Atomnaya Energ. 5, 501-21(1958). (In Russian)

Problems associated with controlled thermonuclear processes are discussed, and a short review is presented of the theoretical and experimental work accomplished by Soviet scientists. (tr-auth)

4586

THE PLASMA CONDENSER. W. O. Schumann (Technischen Hochschule, Munich). Z. Naturforsch. 13a, 888-95(1958) Oct. (In German)

It is shown how, by measurement of the transverse capacity of a discharge tube filled with plasma, information on the maximum plasma density in the middle, the minimum plasma density on the vessel walls, and the collision absorption of the electrons can be obtained. It is also shown how the measured magnitudes change under the effect of a magnetic field in the direction of the discharge. (tr-auth)

4587

ON THE ACCELERATION OF PLASMA IN MAGNETIC FIELDS. G. V. Gordeev and A. I. Gubanov (Inst. of Physics and Tech., Leningrad). Zhur. Tekh. Fiz. 28, 2048-54(1958) Sept. (In Russian)

External axial magnetic field acceleration of plasma enclosed between two infinite coaxial cylindrical electrodes was investigated. Calculations were made of the stationary plasma flow considering electrode friction. The relations between flow rate and electrode radii were determined, and evaluations were made of the energy used to sustain flow. It is shown that with the parameters of the apparatus used, it is possible to accelerate the flow of plasma to supersonic speed. (tr-auth)

GEOLOGY AND MINERALOGY

4588 TEI-616

Geological Survey, Washington, D. C.
SYNTHESIS OF CALCIUM VANADATE MINERALS AND RELATED COMPOUNDS. Richard Marvin. June 1956. 27p. $4.80(ph OTS); $2.70(mf OTS).

Synthesis of natural vanadates shows that most of them are stable in an acid environment. Phase studies of a portion of the system $CaO-V_2O_5-H_2O$ indicate that calcium vanadates are an indicator of environmental pH conditions. Some minerals, such as pascoite, indicate rapid evaporation of vanadate solutions; other minerals, such as hewettite, show that slow evaporation took place. Cursory examination of systems $K_2O-UO_2(NO_3)_2-V_2O_5$ and $CaO-UO_2(NO_3)_2-V_2O_5$, both in aqueous solution, has yielded information on the relationships among carnotite, tyuyamunite, and rauvite. (auth)

4589 CEA-tr-A164

LES GÎTES URANIFÈRES EN AUTRICHE. NATURE, DISTRIBUTION GÉOGRAPHIQUE, IMPORTANCE ÉCONOMIQUE ET PERSPECTIVES. (Uranium Deposits in Austria, Nature, Geographic Distribution, Economic Importance, and Future.) H. Meixner. Translated from Atompraxis 1, 233-9(1956). 30p.

Information concerning the location and geographic distribution of outcroppings of U minerals in Austria is given. The deposits, which belong to those important

and typical layers found at different points on the earth, are described, and their economic importance is discussed. (T.R.H.)

4590

INVESTIGATIONS OF RADIUM IN SEDIMENTS FORMED BY HYDROMINERAL SOURCES. G. Atanasiu. Acad. rép. populaire Roumaine, Rev. phys. 2, 271-82 (1957). (In French)

The radium content of a number of limestone tuffs deposited by mineral sources was determined. The age of the tuffs of Anies and Singeorz was determined by a method based on the radiodisintegration. (J.S.R.)

4591

SYNTHESIS AND PROPERTIES OF CARNOTITE AND ITS ALKALI ANALOGUES. Paul B. Barton, Jr. (U. S. Geological Survey, Washington). Am. Mineralogist 43, 799-817(1958) Sept.-Oct.

Carnotite and its Na, Rb, Tl, Cs, and H_3O(?) analogs have been synthesized in several different ways in attempts to obtain crystals suitable for single crystal structural investigations. Aqueous methods failed to produce usable crystals, but a simple fusion technique using metavanadate fluxes proved highly satisfactory. Work in progress has shown that carnotite is composed of $[(UO_2)_2V_2O_8]_n^{-2n}$ layers bound together by alkali ions with or without water. Studies of the rate of precipitation of carnotite from aqueous solution as a function of pH suggest that the reaction involves interaction between uranyl, alkali, and metavanadate ($V_4O_{12}^{-4}$) ions, though this is not the only possible interpretation of the data. The x-ray and optical properties of the synthetic compounds are presented. The similarity of the a and b dimensions in metatyuyamunite, sengierite, and the alkali analogs of carnotite shows that the same $[(UO_2)_2V_2O_8]_n^{-2n}$ layer is present in all of these compounds. The Na analog of carnotite is less stable than the other carnotites, and it is not expected that the pure Na variety would occur in nature. (auth)

4592

THE RADIOACTIVITY OF THE ATMOSPHERE AND HYDROSPHERE. Hans E. Suess (Scripps Inst. of Oceanography, La Jolla, Calif.). Ann. Rev. Nuclear Sci. 8, 243-56(1958).

A brief account is given of the nature of geochemical, meteorological, and oceanographic problems involved in the interpretation of the distribution of radioactivity in the atmosphere and hydrosphere. The radioactivity is discussed as to source, primary radionuclides and their daughters, cosmic-ray production, and artificial production. (W.D.M.)

4593

GEOCHRONOLOGY BY RADIOACTIVE DECAY. L. T. Aldrich and G. W. Wetherill (Carnegie Inst., Washington). Ann. Rev. Nuclear Sci. 8, 257-98(1958).

The developments which have occurred in recent years in geological dating by radioactive decay are discussed. The developments have been most striking in the fields of potassium–argon and rubidium–strontium dating. Decay constants are given for the elements used in measurements. The nature of the agreement of mineral ages is considered. Discordant uranium–lead ages are discussed. (W.D.M.)

4594

THE GEOLOGY OF NUCLEAR MINERAL RESOURCES. M. M. Konstantinov. Atomnaya Energ. 5, 558-63(1958). (In Russian)

A review is presented on the geology of nuclear mineral resources, based on the data presented at the 2nd International Conference on Peaceful Uses of Nuclear Energy, Geneva, 1958. (R.V.J.)

4595

GEOBOTANICAL PROSPECTION OF URANIUM IN ESTEREL. M. Goldsztein. Bull. soc. franc. mineral. et crist. 80, 318-24(1957). (In French)

A study of uranium dispersion in common plants of the mediterranean regions is described, and the influence of a uraniferous mineralization on the U content of their ashes is examined. The efficiency of this technique is compared with that of geochemical prospecting in soils. Geobotanical prospecting can find a wide field of application in dry or arid countries and in all cases where the residual soils are found wanting. (auth)

4596

THE AIRBORNE SCINTILLOMETER; A GEOPHYSICAL APPLIANCE FOR GEOLOGICAL AND MINING SURVEYS. C. R. Collin, H. Sanselme, and J. Thomas. Echo mines et met. No. 3506, 6p.(1957) July.

The airborne scintillometric survey of the Mortagne batholite (Vendée-France), has brought to light certain facts about the interpretation of small, or even of spot, anomalies in uranium prospecting. If carried out accurately, the interpretation can make it possible to establish with accuracy the correlation between the classical detailed geological map and the isorad map. This is of particular interest in areas where the density of outcrops is low. (auth)

4597

URANIUM IN SOME FRENCH GRANITES. R. Coulomb, M. Goldsztein, and M. Le Mercier (Commissariat a l'Energie Atomique, Fontenay-aux-Roses, France). Geochim. et Cosmochim. Acta 15, 10-17(1958) Nov. (In French)

The laws of statistical distribution of uranium and potassium in a French granite massif in Brittany are given. Systematic analyses have allowed geographical distribution of these two elements and the establishment of the existence of correlations between the petrographic characteristics and the uranium contents. The statistical and geographic variations of the uranium content were studied as a function of the potassium content of the granite and as a function of the presence of uraniferous deposits. (tr-auth)

4598

PEGMATITES OF THE MIDDLETOWN AREA, CONNECTICUT. Frederick Stugard, Jr. U. S. Geol. Survey Bull. 1042-Q. 75p. and 2 illus.

The pegmatites of the Middletown area in Connecticut have been mined almost continuously for feldspar and muscovite mica since about 1865. Pegmatites in this and other areas have recently become the subject of renewed interest because they are the potential source of beryl. From 1948 to 1950 the Geological Survey studied and mapped the pegmatites in an area of about 58 square miles near Middletown. The primary objectives of the mapping were to determine beryllium resources of the Middletown area and to ascertain relations of beryl-bearing pegmatites to non-beryl-bearing pegmatites and to type of wall rock. More than 330 concordant and discordant pegmatites were examined within the mapped area. The pegmatites cut the metasediments of the Bolton schist of pre-Mississippian(?) age and, in ascending order of sequence, mafic gneisses, the Glas-

tonbury granite gneiss, Maromas granite gneiss, and Monson gneiss. The position of these formations in the stratigraphic column cannot be determined with accuracy; their maximum age is indicated by their relation to the pegmatites, which have been dated by uranium- and thorium-lead ratios as about 260 million years old, presumably Mississippian. The pegmatites are composed essentially of perthite, quartz, plagioclase, and muscovite. The common accessories are tourmaline, beryl, garnet, and biotite. The pegmatites have been divided into four groups based on the content of plagioclase feldspar: those with less than 40% of plagioclase, with and without beryl; and those with more than 40% of plagioclase, with and without beryl. About 42% of the pegmatites contain more than 40% plagioclase, and 58% of them contain less than 40% of plagioclase. (auth)

4599

RECONNAISSANCE FOR RADIOACTIVE MINERALS IN WASHINGTON, IDAHO, AND WESTERN MONTANA 1952-1955. Paul L. Weis, Franck C. Armstrong, and Samuel Rosenblum. U. S. Geol. Survey Bull. 1074-B. 44p.

About 50 occurrences of radioactive minerals and nearly 50 properties not abnormally radioactive were examined during geologic reconnaissance for radioactive minerals in Idaho, Washington, and western Montana during the period July 1952 to June 1955. The most important uranium deposits are in or near granitic to quartz monzonitic intrusions of probable Cretaceous age in central and northern Idaho, westernmost Montana, and northeastern Washington. These areas are considered to be most favorable for prospecting. Margins of granitic intrusive bodies in central Montana and western Washington may also be favorable. Uranium-bearing pegmatites associated with granitic intrusive rocks are considered too small and too low grade to be potential sources of uranium. Some placer deposits in southern and central Idaho contain sufficient concentrations of uranium minerals to be of interest as a source of uranium. Known thorite-bearing veins are confined to Precambrian rocks of the Belt series in northern and east-central Idaho and southwestern Montana. Monazite-rich layers in metamorphic rocks in east-central Idaho do not seem large enough and continuous enough to permit profitable mining. (auth)

4600

ISOTOPIC COMPOSITION OF A LEAD GALENA. H. Fr. Ehrenberg and H. J. Mürtz (Univ. of Bonn). Z. Naturforsch. 13a, 854-5(1958) Oct. (In German)

Mass spectrographic measurements were made on the isotopic composition on lead earths, and the results were evaluated on the basis of the general model representation. Some comparative measurements are reported which show that the mass spectrometers in Bern and Bonn produced equal results within experimental accuracy. (tr-auth)

4601

URANIUM DEPOSITS OF THE URAVAN MINERAL BELT. H. B. Wood and M. A. Lekas (U. S. Atomic Energy Commision, Grand Junction, Colo.). pp. 207-15 in "1958 Guidebook of the Intermountain Association of Petroleum Geologists." [1958].

The Uravan Mineral Belt consists of a narrow elongated area in which carnotite deposits generally have closer spacing, larger size, and higher grade than those in the adjoining areas. A brief summary of the structure and stratigraphy, lithologic and sedimentary features related to ore deposits, mineralogy, production, exploration, and development is presented. (J.E.D.)

HEALTH AND SAFETY

4602 CEA-779

France. Commissariat à l'Énergie Atomique, Paris.
ESSAIS DE DÉCONTAMINATION SUR TISSUS DE COTON. (Decontamination Tests on Cotton Materials.) P. Cohen and C. Pelletier. 1958. 3p.

It is shown that versene gives the best decontamination results on cotton materials soiled by a mixture of fission products. (auth)

4603 NP-7139

Brussels. Centre d'Étude de l'Énergie Nucléaire.
ETALONNAGE D'APPAREILS POUR LA MESURE DES DOSES DE RADIATIONS EXTERIEURES RECUES PAR LE PERSONNEL. (Calibration of Apparatus for the Measurement of External Radiation Doses Received by Personnel.) C. Van Eyck. July 17, 1958. 4p.

Techniques for calibrating survey meters, pocket chambers, and film badge personnel dosimeters are given. (T.R.H.)

4604 ORNL-2590

Oak Ridge National Lab., Tenn.
HEALTH PHYSICS DIVISION ANNUAL PROGRESS REPORT FOR PERIOD ENDING JULY 31, 1958. Nov. 10, 1958. 179p. Contract W-7405-eng-26. $3.00(OTS).

Expanded research and development programs increased gradually the amount of activity released to local streams. Data on activity levels during 1950 to 1957 are tabulated. A process-waste-treatment plant was completed in August 1957. The plant utilizes gravimetric chemical feeding, flash mixing, coagulation, and sedimentation and has a capacity of 500,000 gal/day. Flexibility in design provides for recirculation of plant effluent, the return of preformed crystals, precipitation, and the addition of clay when necessary. An equalization basin with an operating capacity of 700,000 gal is provided to minimize fluctuations in chemical composition of the influent waste. A summary is presented of results for the first six months of operation. A schematic sketch of the plant and a flow diagram of the process-waste system are included. Studies were made on the geology and hydrology of the areas used for pit disposal of intermediate-level wastes. Monitoring activities are summarized, and the development of an improved well probe is reported. Observation wells were drilled in a proposed site for a new burial ground for solid wastes. Data are tabulated from ecological studies conducted in areas contaminated by waste disposal operations. The bed of the former White Oak Lake, formerly used to impound low-level liquid wastes, and the forest areas immediately surrounding the radioactive waste pits were surveyed. The distribution of fission products was determined in the soil, plant, and animal components of these environments. The physical and chemical properties of wastes were investigated, and a number of synthetic waste samples were prepared as references. Experiments on the fixation of high-level wastes by sintering are outlined. The experimental furnace and mixer assembly, off-gas system, and equipment for thermal measurements and power control are described and illustrated. Data are included from preliminary studies. The proposed use of salt formations as a disposal medium for radioactive wastes is discussed. Criteria for site selection are outlined. Progress is

reported in studies of problems related to the disposal of radioactive wastes into deep wells. Measurements were made during Operation Plumbbob of the angular distribution of gamma rays and fast neutrons, attenuation factors for two light-frame structures, air dose, and related measurements. Preliminary data are presented from an evaluation of the radiation protection afforded by residential structures against radiation from distributed sources. Studies were continued on the theoretical physics of dosimetry. Preliminary results are reported from neutron-dose studies in small phantoms, the interactions of electrons in gas, and calculations of intranuclear cascades. Design features and performance data are given for a small personnel dosimeter for beta and gamma radiation. The energy distribution of the electron flux was measured in several irradiated and non-irradiated materials. Data are presented graphically. Measurements were made on the disappearance of enriched uranium from the lungs of dogs after inhalation of a uranium-235 oxide aerosol. A schematic sketch is included of an aerosol sampler designed to collect directly on an electron-microscope grid. Data are included from a study of factors affecting the tissue distribution of uranium-235, manganese-52-54, and cesium-137 in mice. Maximum permissible concentration values were calculated for a number of radionuclides. Data are tabulated on the chemical composition of human tissues. The tissues were analyzed by emission spectroscopy, flame photometry, neutron activation, and wet chemistry. Routine monitoring activities are summarized. Data on fall-out are presented graphically. A list is included of publications, papers, and lectures presented during the period. (For preceding period see ORNL-2384.) (C.H.)

4605

INTERPRETATION OF REGULATIONS GOVERNING THE SHIPMENT OF RADIOACTIVE MATERIAL. Carl W. Buckland, Jr. (Los Alamos Scientific Lab., N. Mex.). A.M.A. Arch. Ind. Health 19, 33-43(1959) Jan.

Regulations governing the shipment of radioactive material by common carrier within the United States are reviewed and interpreted. (C.H.)

4606

PRACTICAL CONTROL OF RADIATION HAZARDS IN PHYSICS RESEARCH. Burton J. Moyer (Univ. of California, Berkeley). Ann. Rev. Nuclear Sci. 8, 327-42(1958).

It is proposed to represent contemporary thinking concerning radiation hazards and their evaluation, which should be of practical assistance to the laboratory worker and to those responsible for the design and operation of physical apparatus and experiments which involve nuclear radiation or x rays. Control of radiation hazards is discussed in terms of their anticipation and prior estimation and their measurement or field evaluation. The means are indicated for applying techniques and instrumentation to the evaluation of radiation component intensities in the laboratory and its environs. (W.D.M.)

4607

EXPERIMENTAL INVESTIGATIONS ON THE DECONTAMINATION OF WATER, WITH RESPECT TO THE PREPARATION OF DRINKING WATER FROM RADIOACTIVE CONTAMINATED SURFACE WATERS. I. E. H. Graul and E. K. Reinhardt (Philipps-Universität, Marburg/Lahn, Ger.). Atompraxis 4, 397-402(1958). (In German)

Fundamentals and operation method of a continuous 4-stage process for preparing drinking water from contaminated water are described, together with experiments on radioactive decontamination with model plants on a laboratory scale. Some 250 μc of $Sr^{90}-Y^{90}$/l and 100 μc of P^{32}/l, as well as 1 μc/l of mixed fission products, were used as contamination material. In the case of mixed fission products, the decontamination factors obtained for the important radionuclides Sr^{90}, Sr^{89}, and Cs^{137} lie between 22,000 and 7,200; the corresponding individual residual activities lie 2 powers of 10 and more below the maximum permissible concentration when supply is permanent (MPC_p). A portable filter unit composed of several parts with a motor pump and an output of 400 l of water/h, working on the same principle, is also presented. In conclusion, a 2-part portable filter unit under development is mentioned; it is mounted on a trailer with 1 or 2 axles and has an output of up to 4000 l/h. (auth)

4608

RADIATION OUTSIDE THE DEFINED FIELD. J. H. Martin and Ann Evans (Peter MacCallum Clinic, Melbourne). Brit. J. Radiol. 32, 7-12(1959) Jan.

Three possible sources of radiation reaching the gonads of individuals concerned in radiotherapy procedures are considered. These are radiation to the gonads of the patient due to radiation scattered from the treatment region, radiation leaking through the tube housing, and radiations to the gonads of an individual holding a patient during treatment due to leakage radiation and radiation scattered from the patient. The effects of various parameters on the levels of radiation involved are reported. (auth)

4609

THE DEPENDENCE OF THE RADIATION PROTECTION EFFECTIVENESS OF 5-HYDROXYTRYPTAMINE ON CONCENTRATION AND THE TIME FACTOR. H.-J. Melching, M. Langendorff, and H.-A. Ladner (Univ. of Freiburg i. B.). Naturwissenschaften 45, 544(1958). (In German)

The dependence of the radiation protection effectiveness of 5-hydroxytryptamine was investigated as a function of the concentration and the time factor. White mice with an average weight of 20 g were used. The results showed a good prophylactic effect if the drug was given from 30 min before to directly before the whole-body irradiation with 810 r. The maximum effective concentration was 1.0 mg/animal for intraperitoneal injections. (J.S.R.)

4610

THE ACTIVATION OF ANTIMONY IN ADHESIVE PRODUCTS. H. R. Lukens, Jr. (Shell Development Co., Emeryville, Calif.). Nucleonics 17, No. 1, 83(1959) Jan.

A potential radioactive hazard was encountered subsequent to a 30-day pile irradiation of some steel samples at a thermal neutron flux of 5×10^{11} n/cm^2/sec. The hazard was caused by black plastic electrical tape used to seal the sample containers and by adhesive radioactivity warning labels used to provide immediate post-irradiation radioactivity warning. During activation of the steel sample, the tape and labels developed enough activity to measure about 100 mr/hr at 1 ft several weeks later, and in addition these adhesive materials became brittle and powdery. Half-life and

gamma-energy determination indicated that the offending isotope was 60-day Sb^{124}. The use of adhesive materials such as these should be preceded by an assessment of this potential hazard. (J.H.M.)

4611

ENVIRONMENTAL SURVEYS FOR NUCLEAR FACILITIES. Charles A. Pelletier (Astra, Inc., Raleigh, N. C.). Nucleonics 17, No. 1, 56, 58-9(1959) Jan.

Information is presented on how a survey should be conducted to determine the effect a nuclear facility may have on the radioactivity level of its environment. An environmental survey for a high-power reactor installation is used as an example. Procedures for monitoring land, air, and water are discussed, and instrumentation and personnel needed and estimated costs are included. (J.H.M.)

4612

A LIMITED SURVEY OF RADIATION EXPOSURE FROM DENTAL X-RAY UNITS. Robert O. Gorson, Ronald M. Halvorsen, et al. (Univ. of Pennsylvania and Dept. of Public Health, Philadelphia). Radiology 72, 1-13(1959) Jan.

The Department of Public Health of the City of Philadelphia instituted in 1956 a study of radiation exposure from various medical x-ray units. Data are reported from a survey of the radiation received by dentists, their assistants, and their patients. Fifty-six dental x-ray units were included in this study. The radiation exposure doses appear to be on the average considerably less than maximum permissible average weekly doses. Results are summarized and discussed. (C.H.)

4613

FILTRATION PLANTS REDUCE RADIOACTIVITY IN RAW WATER. Water Works Eng. No. 111, 157(1958).

As part of a survey conducted by the USAEC, samples of raw and treated water were sent daily for 9 months from the water works at Spartanburg, S. C., to the Massachusetts Institute of Technology for testing to determine the effectiveness of water treatment systems in removing radioactive materials. The results of the survey indicated the following: after atomic tests radioactivity occurs in the water supply and rainfall increases the amount; the maximum amounts of radioactivity recorded, even in raw waters, are well below the amounts considered significant from a health standpoint; the R. B. Simms filtration plant removes up to 80% of the radioactivity originally present in the raw water; and immediately following the detonation of an atomic device during the period of maximum fall-out, water filtration plants remove 50 to 75% of the radioactive particles. (auth)

4614

BEZOPASNOST' RABOT S RADIOAKTIVNYMI VESHCHESTVAMI. (Safety Measures in Handling Radioactive Substances.) Boris Mikhaylovich Zlobinskiy. Moscow, Metallurgizdat, 1958. 227p.

An introductory chapter discusses the use of radioactive substances in scientific research and industry. The nature of radioactivity, the biological effects of radioactivity, decontamination, and methods of general and individual protection against radioactivity are then described. The layout of a laboratory and laboratory equipment is discussed, along with ventilation and emergency warning systems. (TCO-J.S.R.)

INSTRUMENTS

4615 AECU-3940

Knolls Atomic Power Lab., Schenectady, N. Y.

NEUTRON DETECTOR DEVELOPMENT PER KPE-2033: IMPROVED PROPORTIONAL COUNTER AND KPE-2034: HIGH SENSITIVITY FISSION COUNTER. P. L. Eisenacher and W. M. Trenholme. [1956]. 126p. Contract W-31-109-Eng-52. $19.80(ph OTS); $6.30(mf OTS).

A boron-lined, neutron-sensitive, proportional counter which meets the requirements of KAPL Specification KPE-2033 was developed, tested, and delivered. The unit comprised three individual counters in parallel connection. The individual counters were usable about ten minutes after having received 7.3×10^{16} nvt resulting from 26 days exposure to a flux of 3.25×10^{10} nv. There was less than 10% reduction in sensitivity and only a slight alteration of plateau characteristics after the exposure. The damage-resistant counter had a shell of 2S aluminum and was filled with a mixture of 95% argon and 5% carbon dioxide to a pressure of 20 cm Hg. The shell was coated with 0.4 mg/cm^2 of boron enriched to 96% B^{10}. Prior to filling, the counter assembly was out-gassed by heating to 350°C under a vacuum of 1 to 5 microns for 16 hours. (auth)

4616 AERE-R/R-2642

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

THE STATIC STRENGTH OF PRESSURE FED GAS JOURNAL BEARINGS; JET BEARINGS. C. H. Robinson. Sept. 1958. 68p. $1.26(BIS).

The operation of a jet-type hydrostatic bearing is analyzed; the analysis suggests certain parameters which are used in the presentation of experimental data. Methods of predicting the load carried by, and the flow requirements of, such a bearing are given. (auth)

4617 AFOSR-TN-58-601

Florida State Univ., Tallahassee.

A MODERATELY VERSATILE PROGRAM CIRCUIT FOR COUNTING EXPERIMENTS. Technical Report No. 3. Richard D. Deslattes and Dewey L. Clemmons, Jr. 1958. 16p. Contract AF18(603)-64. (AD-162126).

An element basic to an automatic measuring system is a program circuit to control the counting equipment, the recording of data, and the simple servo motions required in changing absorbers, samples, wavelengths, etc. A device is discussed which was designed to execute various measurements in absorption and emission spectroscopy utilizing a two-crystal x-ray spectrometer. Its design is open, so that sequential procedures of arbitrary complexity may be executed by means of simple extensions of the circuitry. (W.D.M.)

4618 CERN-PS/CS-14

European Organization for Nuclear Research, Geneva.

ON THE SYSTEMATIC ERROR OF THE HALL COMPUTER CAUSED BY THE FIELD DEPENDENCE OF THE HALL COEFFICIENT. Ch. Schmelzer. Sept. 30, 1953. 2p.

The accuracy of the Hall computer for the frequency program of a proton synchrotron depends on how well the linear relationship between magnetic field and Hall voltage is established. Rather large deviations of the Hall coefficient have been observed when the magnetic

field increases from low values to 1000 gauss or more. The Hall computer is shown to be quite insensitive to such disturbing effects. (A.C.)

4619 CERN-PS/CS-15
European Organization for Nuclear Research, Geneva.
FURTHER REMARKS ON THE HALL COMPUTER. Ch. Schmelzer. Dec. 7, 1953. 8p.

The influence of applied voltage phase errors on the accuracy of computation is discussed. It is shown that small voltage phase deviations may introduce a systematic error in frequency. It is pointed out that although the AVC circuit in the computer is simple in principle, it must possess a very high degree of regulation. (A.C.)

4620 CREL-774
Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.
TRANSISTORIZED COUNTING SYSTEMS. 8. AN AUTOMATIC RADIOACTIVE FOIL COUNTING APPARATUS. L. B. Robinson and W. D. Howell. Sept. 1958. 61p. (AECL-711). $1.50(AECL).

An automatic counting apparatus which may be used to count pulses from radioactive samples for precisely defined counting times is described. Counts are simultaneously recorded in two separate scalers; other scalers give a record of total elapsed time, counting interval, and sample number. All of this information is automatically recorded after each counting interval by both an electric typewriter and a tape punch. Automatic sample changers controlled by the apparatus make it possible to count and recount a large number of samples for an indefinite period. (auth)

4621 GAT-263
Goodyear Atomic Corp., Portsmouth, Ohio.
SINE WAVE GENERATOR APPLICATIONS TO PROCESS DYNAMICS. J. E. Walker and W. B. Harbarger, Jr. Dec. 20, 1958. 38p. Contract AT(33-2)-1. $1.25(OTS).

A pneumatic sine wave generator has been constructed to aid in the study of plant process dynamics and control system design at the Goodyear Atomic Corporation. By utilizing sinusoidal excitation of process and control system components, the response of these components to dynamic excitation can be investigated by frequency response techniques in obtaining a better understanding of the operating characteristics of the equipment presently in use. This frequency response also provides a basis for evaluating proposed modifications and design changes. Criteria for improving both process equipment and control systems can be established. The sine wave generator provides the sinusoidal excitation needed for these investigations and provides for the reduction of the sinusoidal response signals to electrical form for analysis. Process control considerations, a typical problem formulation and solution, and the sine wave generator are discussed. (auth)

4622 LA-2261
Los Alamos Scientific Lab., N. Mex.
FUEL LEVEL DETECTOR. L. H. Thacker. July 1958. 14p. Contract W-7405-eng-36. $0.50(OTS).

A gamma-sensitive scintillation detector was developed to measure the liquid fuel height in an aqueous homogeneous reactor from a location external to the reactor structure. (auth)

4623 LA-2262
Los Alamos Scientific Lab., N. Mex.
NOTES ON THE DESIGN OF FLOW DISCHARGE VOLTAGE STABILIZERS FOR PHOTOMULTIPLIER TUBE POWER SUPPLIES. Leland K. Neher. Oct. 14, 1958. 17p. Contract W-7405-eng-36. $0.75(OTS).

A series of high-stability neon glow discharge tubes (OG3/85A2) was used to stabilize 1685 volts for the dynode resistance divider of a photomultiplier tube to an accuracy of ±0.2%. The limit of stability and the aging phenomena for the tube operating at reduced currents are discussed but not understood. (auth)

4624 LAMS-2243
Stanford Univ., Calif.
EXPERIMENTALLY DETERMINED CHARACTERISTICS OF IPC FILTERS AND SUPPORTS. Elliott G. Reid. Sept. 1957. 56p. For Los Alamos Scientific Lab. Contract W-7405-eng-36, Subcontract No. U-38, 305-1. $9.30(ph OTS); $3.60(mf OTS).

Filter tests were made, primarily, to establish the pressure loss characteristics of a typical IPC filter over a wide range of flow rates. Secondary objectives were to ascertain the extent of the variation of such characteristics among representative production filters and to determine the additional flow resistance caused by various types of filter-supporting structures. A variation of 68 per cent in weight per unit area was found among the production filters supplied for testing. Experiments showed that the pressure differences required to produce equal velocities of flow through these filters were substantially proportional to their weight:area ratios. Mutually consistent calibration curves (pressure loss coefficient vs. Reynolds number) were obtained for nearly all of the filters tested; such inconsistencies as did appear are believed to be consequences of nonuniformity of filter structure. The additional flow resistance caused by wire screens used for filter support proved to be relatively small—and not at all proportional to screen solidity. The disproportionately large resistance caused by a flat, perforated, sheet-metal supporting grid of small solidity indicates that the additional resistance caused by the introduction of a filter-supporting structure arises, principally, from the obstruction of air flow in the areas of contact rather than from the inherent air resistance of the structure. The most interesting and significant relationship disclosed by these tests is that the variation with Reynolds number of the pressure loss coefficient for a fibrous filter is remarkably similar to that of the drag coefficient for a solid body. (auth)

4625 MLM-CF-58-10-61
Mound Lab., Miamisburg, Ohio.
NUCLEAR BATTERY—THERMOCOUPLE TYPE. Quarterly Progress Report No. 7 [for] July 1, 1958 to September 30, 1958. B. C. Blanke. Jan. 6, 1959. 21p. Contracts AT33-1-GEN-53 and R-65-8-99811-SC-01-91. $4.80(ph OTS); $2.70(mf OTS).

Calculations were made to estimate the minimum amounts of isotopes, as the element or appropriate compound, which had sufficient power output to raise their temperatures to 200 and 2300°C. Construction has begun on a second battery. (For preceding period see MLM-CF-58-7-19.) (auth)

4626 NLCO-770
National Lead Co. of Ohio, Cincinnati.
INVESTIGATION OF HASTINGS FLOWMETER FOR

MEASURING THE FLOW RATE OF URANIUM HEXAFLUORIDE. Donald J. Stoneking and Frederick M. Teetzel. Nov. 15, 1958. 14p. Contract AT(30-1)-1156. $0.75(OTS).

A Hastings flowmeter was investigated for use in metering the flow of uranium hexafluoride gas. This type of flowmeter gave evidence that it could successfully measure the flow of UF_6; however, certain changes would have to be made in the standard instrument to obtain the desired reliability. Difficulties with sensing element breakage and a deposit forming on the sensing element were encountered. (auth)

4627 RIB-37

Army Engineer Research and Development Labs., Fort Belvoir, Va.

SCINTILLATION CRYSTALS. Progress Report for Period April 1, 1957 to April 1, 1958. Robert W. Beadle and Alexander L. White. Apr. 1958. 58p. $9.30(ph OTS); $3.60(mf OTS).

Materials studied in an attempt to discover a new efficient gamma radiation detection crystal are reported. These materials include: BaF_2, $BaCl_2$, $BaBr_2$, BaI_2, PbF_2, $PbCl_2$, $PbBr_2$, ZnF_2, $CdCl_2$, $CdBr_2$, CdI_2, CsI, MgF_2, NaF, $SrCl_2$, SrF_2, $Ba(NO_3)_2$, and $Ba_2P_2O_7$. (W.L.H.)

4628 SCTM-144-58(52)

Sandia Corp., Albuquerque, N. Mex.

STAR TRAIL TIMER. T. M. Schultheis. Oct. 17, 1958. 17p. Contract AT(29-1)-789. $3.30(ph OTS); $2.40 (mf OTS).

A transistorized electronic timer which was designed to control the ballistic camera shutter solenoid is described. Night shots of star trails is the subject under study. The timer is used to ensure accurate opening and closing time of the ballistic camera shutter in order to obtain precise star trail information. (auth)

4629 SCTM-168-58(14)

Sandia Corp., Albuquerque, N. Mex.

THE TE-46 ROMOTAR AIRBORNE ANTENNA. Philip A. Gelt. Aug. 29, 1958. 29p. Contract AT(29-1)-789. $4.80(ph OTS); $2.70(mf OTS).

The antenna was developed for the Romotar program, which is an electronic range measuring program. The antenna is physically small, having a maximum height of 2.3 in., a maximum width of 1.152 in., and a maximum length of 8.09 in. The antenna is inherently matched and has a bandwidth, between 2 to 1 VSWR points, on a 50-ohm transmission line, of 13.6% about a mean frequency of 438 mc. (auth)

4630 SCTM-277-58(14)

Sandia Corp., Albuquerque, N. Mex.

EFFECT OF POOR SWITCHING ON THE OUTPUT VOLTAGE OF A TRANSFORMER. G. G. Downs. Sept. 23, 1958. 30p. Contract AT(29-1)-789. $4.80 (ph OTS); $2.70(mf OTS).

It is inherent in any switching action involving fast times that the switch, not being a perfect device, will change the input signal. In many instances this will not be important, but for other applications it may prove to be detrimental to the performance of the circuit. One such case is the circuit of a signal switched through a transformer to a load such as a spark gap. It is convenient to know the optimum performance obtainable, as well as how the circuit parameters may be varied in order to optimize the circuit. The solution for a ramp function type of switching between a voltage source and the primary of a pulse transformer is presented. The analysis shows how pulse transformers may be designed with a maximum of tolerance to poor switching characteristics. (auth)

4631 SCTM-311-58(16)

Sandia Corp., Albuquerque, N. Mex.

PRECISION WEIGHING WITH COMMERCIAL TYPES OF PLATFORM SCALES. E. T. Gay. Aug. 20, 1958. 8p. Contract AT(29-1)-789. $1.80(ph OTS); $1.80 (mf OTS).

The modification of the reading system of commercial types of platform scales with open weightbeams allows such scales to be used for precise weight determinations in ranges above those obtainable on equal-arms balances. The use of the scale as a comparator between an unknown object and calibrated weight standards eliminates numerous errors encountered in direct weighing. (auth)

4632 SCTM-312-58(52)

Sandia Corp., Albuquerque, N. Mex.

USE OF VIBRATION DATA OBTAINED FROM AIRBORNE TEST VEHICLES. W. C. Myre. Nov. 17, 1958. 37p. Contract AT(29-1)-789. $6.30(ph OTS); $3.00(mf OTS).

The proper use of vibration data obtained from telemetered flight test vehicles is an area of constant misunderstanding by data users. This memorandum gives the methods of obtaining, reducing, and reading vibration data as well as the capabilities and limitations of the system. (auth)

4633 SCTM-364-58(14)

Sandia Corp., Albuquerque, N. Mex.

INVESTIGATION OF THE TRANSFER CHARACTERISTICS OF A TYPICAL TRIGGERED SPARK GAP. I. H. Gilbert. Dec. 12, 1958. 53p. Contract AT(29-1)-789. $9.30(ph OTS); $3.60(mf OTS).

A typical triggered spark gap is investigated to determine the effects of different operating voltages, gas pressures, trigger voltages, and trigger input capacitance upon probability of triggering and transfer. (auth)

4634 UCRL-8473

California. Univ., Berkeley. Radiation Lab.

GREATER GAIN-BANDWIDTH IN TRIGGER CIRCUITS. Melvin Brown. Sept. 25, 1958. 27p. Contract W-7405-eng-48. $0.75(OTS).

The relation between switching speed of a trigger circuit and the gain-bandwidth (GBW) of an amplifier is discussed. A special series connection of two tubes, referred to as a dynamic plate-load amplifier, is then presented and analyzed. It is shown that the dynamic plate-load amplifier may have three times the advantage in GBW over a conventional amplifier using the same tube type. This GBW improvement recommends its utilization in fast trigger circuits. (auth)

4635 WADC-TR-57-415

Wright Air Development Center. Aeronautical Research Lab., Wright-Patterson AFB, Ohio.

GAS-RECOIL FAST NEUTRON SPECTROMETER. R. E. Benenson. June 1958. 36p. Project No. 7112. (AD-155673; PB-151187). $1.00(OTS).

A gas-recoil fast neutron spectrometer based on the collimation scheme of R. Giles was constructed and its behavior analyzed. The principal effort was directed to improving the peak-to-valley ratio of the instrument. Electron capture was minimized and anticoincidence end-effect counters incorporated in the present design.

A graphical analysis was made of the collimation scheme and the results predicted by the analysis compared with experiment. $Li^7(p,n)Be^7$ and $D(d,n)He^3$ neutron groups were observed by using, in turn, palladium-filtered hydrogen and pure propane as spectrometer fillings. Energy resolutions of 10% and under with efficiencies exceeding 10^{-4} were obtained with peak-to-valley ratios of 10 to 1. Neutron groups from the $Be^9(d,n)B^{10}$, $C^{12}(d,n)N^{13}$, $O^{16}(d,n)F^{17}$, and $Ar^{40}(d,n)K^{41}$ reactions were observed. (auth)

4636 AEC-tr-3555

SINGLE-PHASE ELECTROMAGNETS WITH SHORT-CIRCUIT RING. (Einphasen-Elektromagnete mit Kurzschlussring.) B. Gerstmann. Translated for Atomics International from Elektrotech. u. Maschinenbau 75, No. 5, 89-92(1958). 12p. (includes original, 4p.) $3.30(ph); $2.40(mf). JCL or LC.

When electromagnets are used with single-phase alternating current, it is usual to use a shading ring, which improves the action of such magnets. In certain operations the magnet would be useless without the shading ring. A synoptic explanation of the operation and an approximate method of calculation for magnets of this type are given. (A.C.)

4637 CEA-tr-A383

OSCILLOGRAPHE À DEUX FAISCEAUX. (Two-Beam Oscillograph.) O. P. Herrukind. Translated from Elektronik (Munich) 5, 267-71(1956). 11p.

Oscilloscope or cathode-ray tubes with two electron beams in one tube envelope are described and discussed. Tables of the electronic and physical characteristics of commercial tubes of this type are given. (T.R.H.)

4638 CEA-tr-A448

MANOMETRE À VIDE AVEC PILE THERMOÉLECTRIQUE: COMPENSATION DE TEMPÉRATURE ET LECTURE DIRECTE DANS UN INTERVALLE TRÈS ÉTENDU. (Vacuum Manometer with a Thermoelectric Cell: Compensation of the Temperature and Direct Reading in a Very Long Interval.) J. M. Benson. Translated by R. Carbonnier from Vakuum-Tech. 6, 181-5(1957). 14p.

The characteristics of industrial manometers using thermoelectric piles are given, and a particular modification which is very useful is described. This type of manometer differs from the classical Pirani gage: ambient temperature compensation apparatus is contained in the manometer tube; the thermoelements are placed so as to compensate for speed of variations in temperature; and the thermoelements are welded end to end to form a continuous conductor very firm and resistant to deterioration. Recent perfections have led to manometers for three pressure ranges, all reading directly on a millivoltmeter. The first range corresponds to maximum sensitivity below 25 μ, the second, below 250 μ, and the third is especially efficient in the range up to 20 mm Hg. (T.R.H.)

4639 CEA-tr-R360

SPECTRES DE LUMINESCENCE DES SCINTILLATEURS EN MATIÈRE PLASTIQUE AVEC DE LA TRIPHÉNYLPYRAZOLINE. (Luminescence Spectra of Scintillators in Plastic Material with Triphenyl-Pyrazoline.) E. A. Andreestchev and I. M. Rozman. Translated by B. de Trezvinsky from Optika i Spektroskopiya 2, 448-93(1957). 13p.

By means of a monochromator and a photomultiplier, the luminescence spectra of polystyrene-base scintillator with additions of 1,3,5-triphenylpyrazoline-Δ^2 (TPP) were measured. The luminescence was excited by beta particles and the mercury lines $\lambda\lambda$2537 and 3650 to 3663A. Energy migration at the expense of absorption of the luminescence of polystyrene by TPP plays a secondary role. The amount, less than 80% of the luminescence of TPP, is due to displacement without radiation of the excitation energy, even for low concentrations of TPP. (T.R.H.)

4640 CEA-tr-R484

ETUDE QUANTITATIVE DE L'ACTION PHOTOGRAPHIQUE DES ÉLECTRONS DE DIFFÉRENTES ÉNERGIES. II. LA SENSIBILITÉ ÉLECTRONIQUE DES ÉMULSIONS EN FONCTION DES DIMENSIONS MICRO-CRISTAUX DANS CELLES-CI. (Quantitative Study of the Photographic Study of Electrons of Different Energies. II. The Electron Sensitivity of Emulsions as a Function of the Micro-Crystal Dimensions in Them.) K. S. Bogomolov, E. P. Dobroserdova, and V. N. Zharkov (Jarkov). Translated by B. Vinogradoff from Zhur. Nauch. i Priklad. Fot. i Kinematografi 1, 19-20(1956). 10p.

A sensitometric technique using electrons at 20 to 90 kev was used to show that the sensitivity of an emulsion with homogeneous grains is directly proportional to the average radius of the grains. This relation can be interpreted as showing that the photographic effect depends uniquely on the secondary electrons produced by the primary beam in a fine superficial layer of silver halide. In fine-grain emulsions the sensitivity depends more strongly on grain size. This is explained by the fact that the dimensions of the fine grains approach that of the thickness of the halide layer. (T.R.H.)

4641 CEA-tr-R490

SCHÉMA DE COINCIDENCES POUR LE TRAVAIL AVEC DES IMPULSIONS À FAIBLE AMPLITUDE. (Coincidence Scheme for Work with Pulses with Low Amplitude.) V. P. Voronkov and A. M. Frolov. Translated from Pribory i Tekh. Ekspt., No. 3, 40-2(1957). 8p.

A variation of a double coincidence circuit is described which operates over a wide range of pulse amplitudes and has a high sensitivity ($\sim$0.03v), assuring positive operation for low-amplitude input pulses without prior amplification. Used with FEU-19 photomultipliers, the circuit has a resolution time of $\sim 5 \times 10^{-9}$ sec with a high registering efficiency. (T.R.H.)

4642 CEA-tr-R494

APPAREIL POUR LA MESURE DE LA LONGUEUR ET DU NOMBRE DES LACUNES DANS LES TRACES DE PARTICULES CHARGÉES DANS LES ÉMULSIONS PHOTOGRAPHIQUES. (Apparatus for the Measurement of the Length and Number of Gaps in the Tracks of Charged Particles in Photographic Emulsions.) B. A. Vonkovsky, A. I. Galaktionov, and M. I. Tretiakova. Translated by M. Melnick from Pribory i Tekh. Ekspt. No. 6, 42-4(1957). 13p.

An instrument called a lacunometer is described which measures simultaneously: the length of a charged particle track in an emulsion; the lengths of the gaps in the track; and the number of gaps of a given length or greater than a given length. Experimental differential and integral curves of gap-length versus distance covered for protons and π mesons in Nikfi-R-type emulsions are given. (T.R.H.)

4643 CEA-tr-R508

MONTAGE SENSIBLE POUR L'OBSERVATION DE LA RÉSONANCE MAGNETIQUE NUCLEAIRE. (Sensitive Assembly for the Observation of Nuclear Magnetic Resonance.) N. M. Pomerantsov and V. I. Kvlividze. Translated by I. Melnick from Pribory i Tekh. Ekspt., No. 2, 56-9(1957). 10p.

A scheme for nuclear magnetic resonance investigation with improved signal-to-noise ratio is described. It employs total compensation at the amplifier input. The mixing of the signal with the reference voltage is done in a multiplier circuit equipped with an integrator circuit. This scheme gives a signal-to-noise ratio 6 times greater than the autodyne. (tr-auth)

4644

A FREQUENCY MODULATED ASYMMETRIC MAGNETRON. E. Petrascu and I. Vasilescu. Acad. rép. populaire Roumaine, Rev. phys. 2, 253-62(1957). (In French)

A magnetron with a solid anode and in the form of a truncated cone was constructed to obtain a continuous-frequency spectrum. The schematic of the tube is given. The characteristics are examined in detail. (J.S.R.)

4645

THE RELATIVE EFFICIENCIES OF IONIZATION CHAMBERS MADE OF VARIOUS MATERIALS. K. K. Aglintsev, V. V. Mitrofanov, and V. V. Smirnov. Atomnaya Energ. 5, 566-8(1958). (In Russian)

The relative efficiencies of thimble ionization chambers made of plexiglas, aluminum, copper, cadmium, and lead were determined by measuring the angular distribution and energy spectra of secondary electrons knocked on from the above materials by Cs^{137} and Co^{60} γ rays. Measurements were made on a 270° magnetic spectrometer with a uniform magnetic field. A special turning arrangement and a system of lead collimators permitted investigations of the electron spectra knocked on by γ rays from the source at 0, 15, 30, 45, 60, 80, 105, 130, 150, 165, and 180° angles. Relative efficiencies of ionization chambers made of various materials for quanta at 1250 to 662 kev are tabulated. (R.V.J.)

4646

THE ABSOLUTE γ-RAY EFFICIENCIES OF IONIZATION CHAMBERS. V. V. Smirnov. Atomnaya Energ. 5, 568-9(1958). (In Russian)

The absolute number of electrons was found by determining the total spectrum of all secondary electrons knocked from a 1.5 mm thick aluminum plate by Co^{60} γ rays ($h\nu$ = 1.17 and 1.33 Mev) and comparing it to the measured β spectra of sources of known activity under the same conditions. The angular distribution of electrons in the range 0 to 180° was determined for each 100-kev energy interval. The graphic presentation of electron angular distributions at 300 to 400 and 900 to 1000 kev is shown. Calculations showed that for the chamber investigated, the number of ion pairs formed in 1 sec in 1 cm^3 is $(4.8 \pm 0.5) \times 10^6$. (R.V.J.)

4647

SECONDARY ELECTRON SPECTRA AND THE SENSITIVITIES OF COUNTERS TO γ-RAYS. V. V. Smirnov. Atomnaya Energ. 5, 570-1(1958). (In Russian)

The energy distributions of secondary electrons knocked out by Cs^{137} ($h\nu$ = 662 kev) and Co^{60} ($h\nu$ = 1171 and 1331 kev) from an aluminum half cylinder, 20 mm in diameter and 1.5 mm wall thickness, at 0, 15, 30, 60, 80, 105, 130, 150, and 165° angles in two planes were measured. By summing the electron emission in various directions, a picture was obtained of the angular distribution in the perpendicular plane forming a half cylinder. The absolute value of the counter efficiency for one of the γ emitters was found by determining the absolute number of secondary electrons produced in the irradiation of half cylinders by Co^{60} γ rays. This was achieved by comparing the β spectra with W^{185}, Y^{91}, and P^{32} placed on a fine plate of similar shape and dimensions as the target. (R.V.J.)

4648

A HOIST FOR A γ-SOURCE OF ACTIVITY UP TO 300 g-EQUIVALENT Ra FOR PROLONGED IRRADIATIONS OF PLANTS. V. S. Semin, A. I. Sal'nikov, and V. E. Nesterov. Atomnaya Energ. 5, 575-6(1958). (In Russian)

4649

MODERN DEVICES USING RADIOACTIVE ISOTOPES FOR THE NON-DESTRUCTIVE TESTING OF WELD SEAMS. A. Dombrowski. Brennstoff-Wärme-Kraft 10, 437-9(1958) Sept.

Portable units using lead-screened Ir^{192} are used by the Engineering Inspection Center at Berlin for weld seam testing. Details are given of their design and handling. Operating personnel are subject to less than 150 mr/month, which is roughly 40% of the permissible level of 5 r/year. (auth)

4650

ON THE THEORY OF NUCLEAR EMULSION SENSITIVITY FLUCTUATIONS. G. I. Zel'tser and A. L. Kartuzhanskii. Doklady Akad. Nauk S.S.S.R. 123, 495-7(1958) Nov. 21. (In Russian)

Previous attempts to develop a theory for ionization fluctuations in emulsions of identical crystals (or groups with identical crystals) failed. The failure of the theory pointed out that ionization fluctuations, even with relativistic particles, play a very unimportant part, and the observed fluctuations of mean track density are related rather to fluctuations in sensitivity of individual crystals. A variation of a theory based on the latter assumption is developed. (R.V.J.)

4651

A PRECISION ELECTRICAL GAUGE FOR MEASURING TRANSVERSE DEFORMATIONS. A. V. Gur'ev. Izmeritelnaya Tekh. No. 4, 31-2(1958) July-Aug.

The transverse deformations are those occurring in relation to longitudinal ones in metals. A three-plate capacity transducer is used to measure the displacements, instead of the normal two-plate system. This improves the linearity and stability. (tr-auth)

4652

TOROIDAL-SECTOR TYPE β SPECTROMETER. S. H. Salai and D. Bereni (Inst. of Nuclear Problems, Hungarian Academy of Sciences). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 877-8(1958) July. (In Russian)

A design is presented of a β spectrometer toroidal coil with a center divided into 42 sectors. The design of the spectrometer differs from the conventional in that the magnetic field is absent in the source and detection points. The spectrometer uses low current (not more than 3 amp, which is less than the current for a magnetic lens), and a diaphragm for the separation of electrons from positrons is not required. These properties make the spectrometer useful in studies of $\beta - \gamma$, $e^- - \gamma$, and $e^- - \beta$ coincidences. (R.V.J.)

4653

PRODUCTION OF A CONTINUOUS BEAM OF IONS OF 12 ma. J. Coutant, F. Prevot, and R. Vienet (C. E. N., Saclay, France). J. phys. radium 18, 644-5(1957) Nov. (In French)

A continuous ion source and its beam-focusing device were developed. It is characterized by the possibility of producing an intense ion current for a given power consumed and a relatively low gas output. (auth)

4654

A REVIEW OF GAMMA DOSIMETRY METHODS. B. D. Dove (Atomic Energy Research Establishment, Harwell, Berks, Eng.). Nuclear Power 4, 124-5(1959) Jan.

Within the dose range 10^4 to 10^7 rads, many systems exist which are suitable for process control, but none has yet received widespread acceptance. A fairly comprehensive but not exhaustive compilation of reported systems is presented, including glass, plastic, photographic film, viscosity, dye solution, and luminescence dosimeters. (W.D.M.)

4655

MAKING FISSION COUNTERS FOR NEUTRON MONITORING. J. M. McKenzie (Atomic Energy of Canada Ltd., Chalk River, Ont.). Nucleonics 17, No. 1, 60-5 (1959) Jan.

Information is presented on the design, construction, and performance of two types of fission counters for reactor monitoring. Both counters use neutron-induced fission in U^{235}. A cylindrical one is for isotropic fluxes of $10^6 n/cm^2/sec$. The other is for monitoring neutron beams of 5×10^5 to $5 \times 10^9 n/sec$ and is of parallel-plate form. (J.H.M.)

4656

PARAMAGNETIC RESONANCE SHOWS RADIATION EFFECTS. Harold C. Box and Harold G. Freund (Roswell Park Memorial Inst., Buffalo). Nucleonics 17, No. 1, 66, 68, 70, 73-4, 76(1959) Jan.

The application of paramagnetic-resonance spectroscopy to the study of radiation effects in solids is discussed. Detailed information is presented on how paramagnetic resonance works. Discussions are included on gases produced in irradiated materials and interactions (Fermi and dipole-dipole) that produce hyperfine structure. G-values are listed for a number of x-irradiated organic compounds. (J.H.M.)

4657

HALOGEN BETA-COUNTER MONITORS FOR CHALK RIVER REACTORS. I. L. Fowler, A. Pearson, and L. A. K. Watt (Atomic Energy of Canada Ltd., Chalk River, Ont.). Nucleonics 17, No. 1, 78, 80, 82-3(1959) Jan.

A gaseous-fission-product monitor designed to detect failures in Chalk River reactor fuel elements is described. A low-voltage, halogen-quenched counter was designed as the detector. The counter is a simple device, requires a straight-forward circuit, has a long life, and is little affected by intense radiation fields. The monitor provides a simple means of measuring a wide range of beta and gamma activity. The range can be further increased without sacrifice of over-all simplicity by additional modification of the counter electrode shape. (J.H.M.)

4658

FASTER PIPE-WELD TESTING USES Ir^{192}. Nucleonics 17, No. 1, 98-9(1959) Jan.

A fast method for pipe-weld testing that utilizes a gamma-ray source along the axis of the pipe has been developed. By this method it was possible to inspect up to 100 welds a day using 1-min exposures on 24-in. and 28-in. pipes. The radiographic source for the inspection is up to 18.5 curies of 74-day Ir^{192}. A cylinder is encapsulated in a steel tube with lead plugs at each end. The source is mounted on a wheeled carrier so that it moves along the axis of the pipe. Markings on the cable attached to the carrier tell the operator when to stop so that the source is opposite the weld to be inspected. Strips of Gevaert Structurix D-7 film are laid around the weld outside the pipe. Welds that connect the longer sections, the so-called "tie-in" welds, must be radiographed with the source outside the pipe. A special source-holding saddle makes this possible. (J.H.M.)

4659

A SPECTROMETER FOR PROTONS. G. Marcazzan (Laboratorie CISE, Milan) and M. Pignanelli (Univ. of Milan and Istituto Nazionale di Fisica Nucleare, Milan). Nuovo cimento (10) 10, 155-9(1958) Oct. 1.

A spectrometer for protons of energy between 2 and 14 Mev is described, which is particularly suitable for the study of protons emitted by nuclei bombarded with 14-Mev neutrons. The particularly low background and the resolution of the instrument are discussed. (auth)

4660

HIGH DENSITY AND LARGE ATOMIC NUMBER SYSTEMS FOR GAS BUBBLE CHAMBERS. P. E. Argan (Univ. of Genoa and Istituto Nazionale di Fisica Nucleare, Genoa) and L. Gonella (Univ. of Turin and Istituto Nazionale di Fisica Nucleare, Turin). Nuovo cimento (10) 10, 182-5(1958) Oct. 1.

The experimental difficulties in the use of high-density, high-temperature, corrosive liquids in bubble chambers are discussed. It is pointed out that many of the difficulties might be removed by giving up superheated liquids and making use of different principles such as supersaturated gas-liquid solutions which can be radiation sensitive at room temperature or temperatures not far above room temperature. A bubble chamber using the above principles is described. Experimental results are tabulated. (A.C.)

4661

PHOTOMETRIC ANALYSIS OF THE TRACKS IN THE NUCLEAR EMULSIONS. III. EFFECTS OF THE DEVELOPMENT ON THE PHOTOMETRIC WIDTH. P. G. Bizzeti, M. G. Dagliana, et al. (Istituto Nazionale di Fisica Nucleare, Florence and Univ. of Florence). Nuovo cimento (10) 10, 388-92(1958) Oct. 16.

The dependence of the photometric width of a track on the degree of development was investigated in G-5 nuclear plates, developed by the standard procedure. It is found that the width varies with the development only through an additive term, which is independent of the nature and velocity of the particle which produced the track. (auth)

4662

OPERATION OF A BUBBLE CHAMBER FILLED WITH "HIGH Z" MIXTURES. L. Bertanza, P. Franzini, et al. (Univ. of Pisa and Istituto Nazionale de Fisica Nucleare, Pisa, Italy). Nuovo cimento (10) 10, 403-4 (1958) Oct. 16.

A bubble chamber using a stainless steel cylindrical chamber was suscessfully operated with methyl iodide–ethane and methyl iodide–carbon dioxide systems, with small additions of propane. (A.C.)

4663

ON THE APPLICABILITY OF ^{4}He GAS SCINTILLATORS AS ANALYSERS OF NEUTRON ENERGY AND POLARIZATION. C. Rubbia and M. Toller (Univ. of Pisa and Istituto Nazionale di Fisica Nucleare, Pisa, Italy). Nuovo cimento (10) 10, 410-11(1958) Oct. 16.

A helium-4 scintillation detector, designed for neutron polarization studies, is described. Performance tests at pressures between 20 and 100 atmospheres and temperatures of 20, 0, and −60°C indicated a pulse-height accuracy better than 10%. Rise and decay times were both about 15 ns. The calculated over-all efficiency of the detector is several times 10^{-4}. (D.E.B.)

4664

THE MAIN PROBLEMS IN DESIGNING SELF-BALANCING RADIATION TYPE LIQUID DENSITY GAUGES. K. S. Furman. Priborostroenie No. 5, 22-4(1958). (In Russian)

Gages using γ transmission or back-scattering are reviewed, including double-beam and single-beam methods. The counter and accessory electronic equipment (discriminator, balancing wedge, etc.) are considered, preference being given to scintillation counters. The theory of the method is presented. No particular apparatus is described in detail. (tr-auth)

4665

PRESSURE GAUGE FOR CORROSIVE GASES IN THE MICRON AND SUBMICRON REGION. J. R. Anderson (Univ. of Melbourne). Rev. Sci. Instr. 29, 1073-8(1958) Dec.

A gage is described, for use with corrosive gases in the range 10^{-2} to 10^{-5} mm Hg, in which the pressure is indicated by the rate of damping of a hinged silica fiber pendulum. Amplitude is measured photoelectrically. The gage exposes only glass and silica to the gas, may be baked to 450°C, and gives an accuracy of pressure measurement of better than 5%. (auth)

4666

MASS SPECTROMETER ION SOURCE FOR SOLID SAMPLES. B. R. F. Kendall (Univ. of Western Australia, Nedlands). Rev. Sci. Instr. 29, 1089-92(1958) Dec.

A single-filament positive ion source for solid samples is described. The source is simple and compact. Heat dissipation is low. Isotopic fractionation effects are very much smaller than is the case with conventional single-filament surface ionization sources. The main ionization process occurring in the source is considered to be the surface ionization of the sample vapor on the tungsten filament. The sample vapor is maintained at a comparatively high pressure inside the source assembly. Investigations are described which indicate that other possible emission processes do not contribute any significant proportion of the emitted ion beam. Variations in the measured relative isotopic abundance ratio K^{39}/K^{41} during a run to exhaustion of the sample are discussed. There is no significant ratio trend with time and the random fluctuations of the measured ratio are such that more than half of the values are within 0.2% of their mean. The mean values can be repeated with a probable error which is less than about 0.3%. (auth)

4667

DOSE-RATE DEPENDENT DOSIMETER FOR LOW-INTENSITY GAMMA-RAY FIELDS. Karen O'Brien, Leonard R. Solon, and Wayne M. Lowder (U. S. Atomic Energy Commission, New York). Rev. Sci. Instr. 29, 1097-1100(1958) Dec.

It has been suggested that a NaI(Tl) phosphor be used to amplify densities enough to make a film dosimeter practicable for the low gamma-ray dose rates produced by background radiation. This use is complicated by the dependence of film density on dose rate as well as dose. An analysis of the process provides a correction for the dose-rate dependence when the dose rate is constant. The magnitude of the error involved in assuming the dose-rate constant when it is a function of time is evaluated. (auth)

4668

EFFICIENT LOW-LEVEL COUNTING SYSTEM FOR C^{11}. J. B. Cumming and R. Hoffmann (Brookhaven National Lab., Upton, N. Y.). Rev. Sci. Instr. 29, 1104-7(1958) Dec.

A low-level counting system used in absolute measurements of the $C^{12}(p,pn)C^{11}$ cross section is described. In this system small activities of C^{11} produced in polystyrene-based plastic scintillators by irradiation with high-energy protons are detected with high efficiency by 4π scintillation counting. Background reduction is achieved by counting in a shield consisting of 12 in. of iron and 1 in. of mercury and by the use of a ring of Geiger counters in anticoincidence with the scintillation counter. A background of 8 counts per min was obtained for a 1.5-in. diam, 1-in. thick scintillator in which the over-all detection efficiency for C^{11} is 90%. Determination of the counting efficiency by a positron-annihilation coincidence method is described and the results of experiments to reduce the background still further are reported. Application of this system to monitoring fluxes of energetic protons and neutrons is discussed. (auth)

4669

IMPROVED MEASURING APPARATUS FOR X-RAY ABSORPTION SPECTROMETRY. H. P. Hanson, W. E. Flynt, and J. E. Dowdey (Univ. of Texas, Austin). Rev. Sci. Instr. 29, 1107-11(1958) Dec.

Two techniques for simplifying data taking and for eliminating the requirement of a carefully stabilized x-ray power supply in x-ray absorption spectrometry were developed. Method I oscillates the sample in and out of the beam with a period that is small compared to drift and the usual x-ray tube instabilities. The corresponding I and I_0 are channeled to two ratemeters, and by analog techniques a quantity proportional to the absorption coefficient is electronically calculated and plotted. In method II, two counters are arranged in tandem with the sample between, yielding I and I_0 simultaneously. The proper apportionment of counts in both arrangements is considered. (auth)

4670

CONTROL DEVICE FOR AN AUTOMATIC HIGH-PRESSURE SORPTION BALANCE. Peter Cannon (General Electric Research Lab., Schenectady, N. Y.). Rev. Sci. Instr. 29, 1115-17(1958) Dec.

A novel photoresistive cell was developed which will sense the position of a beam of light. This cell was used in a servo network to null the arm of an electromagnetic sorption balance. The balance was enclosed in a metal high-pressure shell and was not observable in any conventional way. Details of the construction of the cell are given. (auth)

4671

PULSE AMPLIFIER WITH SUBMILLIMICROSECOND RISE TIME. Fred Sterzer (RCA Labs., Princeton, N. J.). Rev. Sci. Instr. 29, 1133-5(1958) Dec.

A pulse amplifier having a rise time of approximately 0.7 millimicrosecond is described. In the amplifier the d-c input pulses to be amplified modulate a 2750 megacycle carrier, producing pulses at the carrier frequency. The resulting r-f pulses are amplified by a traveling-wave tube, and then demodulated to give amplified d-c pulses. The amplifier works into a 120-ohm load and has a maximum power gain of 20 db; the maximum output voltage is 2.1 volts. (auth)

4672

AUTOMATIC RECORDING VACUUM MICROBALANCE. C. Norman Cochran (Alcoa Research Labs., New Kensington, Penna.). Rev. Sci. Instr. 29, 1135-8(1958) Dec.

An automatic control and recording system for the null-type vacuum microbalance of Czanderna and Honig (Anal. Chem. 29, 1206(1957)) was assembled from commercial components. A variable permeance transducer is employed to detect beam movement and to control a force to restore the beam to the null position. This force is recorded in a selection of ranges extending from 0 to 20,000 μg to 0 to 5 μg with accuracies ranging from 0.1 to 2% of full scale. On the most sensitive settings the balance can detect weight changes as small as 0.01 μg in loads up to 1 g. Stabilities of 0.1 μg were observed for periods of many hours on the most sensitive ranges. The balance is undamped, and no corrections are made to the restoring force if beam oscillation is centered about the null point. (auth)

4673

MERCURY-VAPOR PROPORTIONAL COUNTERS. C. W. McCutchen (Cavendish Lab., Cambridge, Eng.). Rev. Sci. Instr. 29, 1139-40(1958) Dec.

A mercury-vapor filled proportional counter is described. Its behavior as a γ counter is investigated. The resolution is fair (7.5% energy spread at 60 kev); however, the various mercury x-ray fluorescence yields and absorption cross sections combine to make the output spectrum of the counter complex and difficult to interpret. It is found that the output pulses are slow, rising in about 30 μsec, though this can be reduced to about 8 μsec by addition of CO_2 to the filling. (auth)

4674

PYREX DEMOUNTABLE PHOTOMULTIPLIER REFRIGERATOR. Charles J. Bronco, Robert M. St. John, and R. G. Fowler (Univ. of Oklahoma, Norman). Rev. Sci. Instr. 29, 1145-6(1958) Dec.

The measurement of extremely small light fluxes photoelectrically requires the use of a multiplier phototube operated at the temperature of liquid air. A refrigerator for the application is described that is easy to construct and whose plan can be simply adapted to any type and size of tube. (A.C.)

4675

IMPROVED FOUR-PI PROPORTIONAL GAS FLOW COUNTER. Troy C. Martin and O. E. Green (Convair, Fort Worth, Texas). Rev. Sci. Instr. 29, 1147-8(1958) Dec.

In using the "separating-chamber" type of 4π proportional gas-flow counter in "production line" counting, separating the two chambers during sample changing becomes quite difficult. Also, cable troubles sometimes develop because of continued movement of the high-voltage cable. An improved 4π proportional gas-flow counter has been designed and built which eliminates these undesirable features. This counter has proven stable during continuous use without requiring more than routine care. (A.C.)

4676

DIRECTIONAL SCINTILLATION COUNTER. M. A. Thompson (Univ. of Auckland, N. Z.). Rev. Sci. Instr. 29, 1149(1958) Dec.

A collimated scintillation counter was developed which employs bundles of pyrex capillaries filled with a liquid phosphor (xylene with terphenyl and POPOP). Two such counters were constructed and tested; one with 2.8-Mev neutrons, the other with 14-Mev neutrons. Directional ratios of R = 60 and axial efficiencies E = 0.1% were obtained. (D.E.B.)

4677

SPARK COUNTERS AS NEUTRON IMAGE INTENSIFIERS. L. Reiffel (Armour Research Foundation, Chicago). Rev. Sci. Instr. 29, 1151-3(1958) Dec.

A novel neutron-sensitive spark counter with an image resolution of the order of 8 lines/in. was successfully applied to the problem of recording neutron Laue patterns. By use of the Armour Research Reactor to provide a thermal neutron beam, Laue patterns were recorded in less than 60 min at a thermal power level of 10 kw. A natural boron converter plate was used to actuate the spark counter. Measurements with a natural uranium alpha source approximately 1.5 cm in diameter and calibrated with a zinc sulfide scintillation counter indicate an alpha counting efficiency very close to unity. (A.C.)

4678

MEASUREMENT OF HIGH-ENERGY GAMMA-RAYS WITH A PHOTOGRAPHIC BENT CRYSTAL SPECTROGRAPH. E. L. Chupp, J. W. M. DuMond, and Hans Mark (Univ. of California, Livermore). Rev. Sci. Instr. 29, 1153-4(1958) Dec.

Cobalt-60 gamma rays were observed with a 2-meter bent-crystal photographic spectrograph developed at UCRL. The spectrograph employs an extended source placed on the convex side of the crystal and a 600-μ Ilford G-5 emulsion placed on the focal circle to record the gamma-ray lines. The arrangement is diagrammed, and its advantages are discussed. (A.C.)

4679

INCREASING THE EFFICIENCY OF SHORT DIFFUSERS BY MEANS OF SEPARATING WALLS. I. Ye. Idel'chik. Teploenergetika No. 8, 21-6(1958).

Extensive and systematic tests were made of the effects of separating walls on the efficiency of short diffusers. The diffusers were tested with and without a gas distribution grid beyond its outlet section. The velocity distribution was measured in the plane of expansion of the diffuser along the center line of the section, and the resistance coefficient was determined for each variant. Test results show that different types of grids give equally complete uniformity of flow. It was determined that the resistance coefficient does not depend on the Reynolds number. Results are given to show how the installation of separating walls in short diffusers reduces their resistance. The resistance curves show that when the area ratio is increased the reduction in the diffuser resistance which results from the use of separating walls does not decrease but increases slightly. (TCO-J.S.R.)

4680
THE WALL EFFECT IN A SPHERICAL IONIZATION CHAMBER. O. F. Nemetz (Inst. of Physics and Tech., Academy of Sciences, Ukrainain SSR). Ukrain. Fiz. Zhur. 2, 101-5(1957) Apr.-May. (In Ukrainian)

One of the causes distorting the neutron energy spectra, measured by means of an ionization chamber with a volume radiator, is recoil proton collision with the chamber walls. The magnitude of this effect is calculated, and a formula is given which allows correction of the recorded spectrum. (tr-auth)

4681
A HYDROGEN CONDENSATION PUMP. B. G. Lazarev, E. S. Borovik, et al. (Inst. of Physics and Tech., Academy of Sciences, Ukrainian SSR). Ukrain. Fiz. Zhur. 2, 175-82(1957) Apr.-May. (In Ukrainian)

A method for obtaining high vacuum (10^{-8} to 10^{-10} mm of Hg) is developed with a high condensation rate of pumped gases on a surface cooled by liquid hydrogen. Two types of such pumps were investigated, one having a pumping rate of 13,000 l/sec with the pumping element inserted into the evacuated space, the other having a pumping rate of about 4000 l/sec in the form of a flanged unit to be inserted into the vacuum line gap between the evacuated object and the ordinary diffusion pump. The designs described can be employed with the usual vacuum techniques (steel vacuum lines and recipients, rubber gasketed flanges, metal vacuum valves). (tr-auth)

4682
DIFFUSION CHAMBER. V. K. Lyapidevskii. Uspekhi Fiz. Nauk 66, 111-29(1958) Sept. (In Russian)

Descriptions are presented of the design, performance, and applications of diffusion chambers, and comparisons are made of their advantages over Wilson chambers. (R.V.J.)

4683
ION BEAM RECORDING BY ELECTRON MULTIPLIER IN MASS SPECTROSCOPY AND NUCLEAR STUDIES. A. I. Akishin. Uspekhi Fiz. Nauk 66, 331-46(1958) Oct. (In Russian)

Data are reported from studies of ion beam transformation into electrons on multiplying cathodes, the efficiency of particle counting multipliers, and the stability of amplifying coefficients. The designs of a mass spectrometer recording apparatus and a radio-frequency mass spectrometer with magnetic electron multipliers are described, as well as installations for studies of neutron β decay and other nuclear reactions. (R.V.J.)

4684
CALIBRATION OF A SPECTROMETER LEAK DETECTOR. R. Geller. Vide 12, No. 73, 3-14(1958) Jan.-Feb. (In French)

Methods of calibration of a spectrometer leak detector are studied, and the sensitivity of the instrument is discussed. (tr-auth)

4685
AN OMEGATRON LEAK DETECTOR. D. Charles and R. J. Warnecke. Vide 12, No. 73, 25-45(1958) Jan.-Feb. (In French)

A detailed description is given of an omegatron leak detector. Using Ar as tracer in dynamic operation, leaks of the order of 10^{-4} mm^3/hr can be rapidly detected, and it is possible to detect very small leaks of the order of 10^{-6} mm^3/hr by accumulation. (tr-auth)

METALLURGY AND CERAMICS

4686 AECU-3913
Franklin Inst. Labs. for Research and Development, Philadelphia.
A STUDY OF THE STABILITY OF EXTERNALLY PRESSURIZED GAS BEARINGS. Interim Report. Lazar Licht and Harold Elrod. Nov. 1958. 46p. Sponsored by Dept. of Defense; USAEC; and Maritime Administration under Contract Nonr-2342(00). (I-A2049-4). $1.50 (OTS).

The stability of externally pressurized gas bearings is reported. The pertinent equations are linearized, and the stability criteria are stated in considering small deviations from the equilibrium point. The flow in the bearing clearance is treated on a distributed rather than on a lumped parameter basis. Results thus obtained, when compared with those previously arrived at by means of a simplified analysis, show a marked divergence in the limiting values of parameters which influence the stability of the bearing. Differences in predictions of the simplified and present analyses with regard to the permissible compression volume in the bearing interspace and the effect of varying the mass of the bearing are emphasized and discussed. (auth)

4687 AECU-3976
Materials Research Corp., Yonkers, N. Y.
METALLURGICAL STUDIES OF ZIRCALOY-2. Final Report [for] November 1, 1957—November 1, 1958. Eric Mendel and Josef Intrater. 66p. For Westinghouse Electric Corp. [Bettis Plant]. Subcontract No. 73-(14-3633). $10.80(ph OTS); $3.90(mf OTS).

This final report covers the three-phase metallurgical study of Zircaloy-2. Information is included on the following: the determination of the composition and structure of the matrix precipitate phase and of the precipitate phase defined by and contained within stringers; the investigation of the temperature limits of the alpha-plus-beta region of the phase diagram using dilatometric techniques to follow the transformation; and the investigation of the kinetics of solution of the matrix precipitate phase after heating into the beta phase region, and the kinetics of subsequent precipitation on cooling from the beta to the alpha plus beta region. (auth)

4688 AERE-M/R-2673
United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.
TRANSFORMATIONS IN URANIUM ALLOYS WITH HIGH SOLUTE SOLUBILITY IN THE B.C.C. GAMMA PHASE. PART I. PRELIMINARY OBSERVATIONS ON THE "BANDED STRUCTURES" PRODUCED BY NON EQUILIBRIUM TRANSFORMATIONS IN URANIUM ALLOYS. A. G. Harding and M. B. Waldron. Sept. 1958. 34p.

The high-temperature body-centered cubic γ phase in uranium alloys with approximately 10 at. % titanium, niobium, zirconium, or molybdenum can be rendered metastable under critical cooling conditions; it may transform thence by a shear mechanism to form a characteristic banded structure or by a nucleation and growth process to equiaxed grains. These decomposition structures with differing metallographic appearances give similar x-ray patterns. The structures are designated "distorted α" since the patterns correspond to a contraction in the b-direction of the normal ortho-

rhombic α cell. The formation of these metastable structures is apparently dependent upon composition, cooling rate, and the effect of the solute element on the incubation period and decomposition rate of the metastable γ phase. (auth)

4689 APDA-126
Atomic Power Development Associates, Inc., Detroit.
EVALUATION OF MATERIAL WEAR AND SELF-WELDING IN SODIUM-COOLED REACTOR SYSTEMS. D. O. Leeser and R. C. Williams. Aug. 1958. 38p.

Laboratory and prototype component tests were made to determine the degree of adhesion and self-welding of various bearing-couple materials in liquid sodium. Tests on these materials were also run in nitrogen and in argon. Temperatures reached were from 500 to 1000°F, and the static loads applied on the bearing surfaces were up to 10,000 psi. Results of the tests demonstrated that the harder materials generally showed better wear resistance than did the softer materials. However, each material has a service life depending upon such factors as: temperature, unit loads, nature of service, and environment. (auth)

4690 BMI-62(Del.)
Battelle Memorial Inst., Columbus, Ohio.
GRAIN REFINEMENT OF URANIUM BY ALLOYING. H. A. Saller, J. R. Keeler, and N. S. Eddy. June 1, 1951. Decl. with deletions Feb. 13, 1957. 30p. Contract W-7405-eng-92. $4.80(ph OTS); $2.70(mf OTS).

Binary alloys of uranium with 38 elements in the range 0.01 to 1.0 at. % were made. Three alloys having nominal compositions of 0.01, 0.1, and 1.0 at. % were made with most of the elements, and in addition, 12 ternary and quaternary alloys were made. The alloys were cast, rolled to $\frac{7}{8}$-inch-diameter bars, heat treated, and examined for grain size. (auth)

4691 BMI-1113(Del.)
Battelle Memorial Inst., Columbus, Ohio.
THE PROPERTIES OF URANIUM CONTAINING MINOR ADDITIONS OF ALUMINUM OR ZIRCONIUM. Henry A. Saller, Frank A. Rough, and Walston Chubb. July 16, 1956. Decl. with deletions Feb. 13, 1957. 27p. $4.80 (ph OTS); $2.70(mf OTS).

The tensile properties, hot hardness, and heat-treatment characteristics of uranium alloys containing up to 2.9 at. % aluminum or 4.0 at. % zirconium are described. The data show that zirconium has a favorable effect upon the grain size, hardness, and tensile strength of uranium without materially affecting ductility. Additions of 3.8 at. % zirconium raised the tensile strength of uranium at room temperature from about 100,000 psi to about 200,000 psi, while the elongation in 2 in. increased from 14 to 22% and the grain size decreased from about 0.20 mm to less than 0.01 mm. The data show that aluminum raises the yield strength, that it has very little effect on either the grain size, hardness, or tensile strength of uranium, and that it decreases ductility. The addition of 2.6 at. % aluminum decreased the room-temperature ductility of uranium from 14 to 4%. (auth)

4692 BMI-1309
Battelle Memorial Inst., Columbus, Ohio.
PREPARATION AND PROPERTIES OF URANIUM MONOCARBIDE CASTINGS. Arthur C. Secrest, Jr., Ellis L. Foster, and Ronald F. Dickerson. Jan. 2, 1959. 17p. Contract W-7405-eng-92. $0.75(OTS).

Using a special arc-melting technique, sound, homogeneous 100-g cylindrical castings of UC of near stoichiometric composition were consistently produced. In the casting process developed, UC buttons previously prepared by arc melting the elements were placed over the opening of a graphite mold in a helium-atmosphere arc furnace. When the UC button became fully molten under the arc, it dropped by gravity into the mold. The densities of the resultant castings were about 98% of theoretical. The castings could be successfully machine ground using a water-base cutting fluid. In a preliminary determination of some physical properties of cast UC, the thermal conductivity measured at 100, 400, and 700°C was 0.060, 0.053, and 0.060 cal/(sec)(cm)(C), respectively. The mean linear thermal-expansion coefficient in the temperature range from 20 to 950°C was 11.4×10^{-6} per C. Cast UC encapsuled in stainless steel exhibited good resistance to thermal stress and shock in two series of tests of 100 thermal cycles to 900°C and 100 cycles to 1100°C. Heat treating a casting specimen for 1 hr at 1000°C produced no significant change in microstructure, but after a subsequent exposure of 1 hr at 1500°C hardening and the appearance of the U_2C_3 phase were evident. In tests of compressive strength on a single specimen rupture occurred at 54,500 psi. (auth)

4693 BRB-44
Bridgeport Brass Co., Conn.
CONTRIBUTION OF THE JOMINY-TYPE END QUENCH TO METALLOGRAPHIC PHASE IDENTIFICATION IN URANIUM. L. Lewis. Dec. 8, 1958. 20p. $3.30(ph OTS); $2.40(mf OTS).

The identification of phases and interpretation of phase transformation through microstructural analysis are still difficult even with metallographic standards as a guide. Macrostructures provide a better guide to determination of the origin of the quenched phase and the degree of quenching. Grain sizes are of some assistance in determining the cooling conditions employed. Twinning concentration and grain boundry shape are inconclusive characteristics to use in determining the origin of the quenched phase and the degree of quenching. Subgrains are more prevalent in beta-treated uranium. Hardness profiles provide highly irregular data and are of little assistance in interpretation of heat-treating conditions. Single and multiple gamma-beta-alpha cycles appear severe enough to cause the formation of small voids in the air-cooled zones of end quench samples. (auth)

4694 CEA-693
France. Commissariat à l'Énergie Atomique, Paris.
COMPORTEMENT MÉCANIQUE DE L'URANIUM. (Mechanical Behaviour of Uranium.) J. Bernard and G. Coureau. 1957. 22p.

The principal mechanical properties of uranium at 20 to 400°C are presented. (auth)

4695 CEA-765
France. Commissariat à l'Énergie Atomique, Paris.
CONTRIBUTION A L'ÉTUDE DES ALLIAGES D'URANIUM PAR ANALYSE THERMIQUE DIFFÉRENTIELLE SOUS VIDE. (Contribution to High Vacuum Differential Thermal Analysis Study of Uranium Alloys.) J. Bellot, J. M. Henry, and G. Cabane. Jan. 1958. 16p.

An apparatus for differential thermal analysis under vacuum is described which can determine the temperatures of structural transformations of U alloys with Al, Fe, Zr, and Mo. The method is sensitive and especially well-suited to determining invariant equilibria in these alloys. It should contribute to the study of the kinetics

of pearlitic-type decompositions, even when they are slow. Studies have been undertaken to obtain quantitative results so as to determine the eutectoid and peritectoid compositions exactly. (T.R.H.)

4696 CEA-766

France. Commissariat à l'Énergie Atomique, Paris.
SUR LE STRUCTURE DES MÉTAUX LOURDS. (On the Structure of Heavy Metals.) J. Friedel. 1958. 14p.

The properties of the last series of Mendeleef's table are compared with those of the elements of the preceding series. This comparison suggests an electronic structure of the "transition metal" type, with narrow bands, at the beginning of this series (up to certain phases at least of plutonium); then of the rare earth metal type, with independent non-saturated internal layers, further on in the series. The 5f orbits seem to play an important part in these two types of structure, from uranium on. A more detailed study of the very heavy elements (americium and beyond) and alloys would allow these conclusions to be confirmed. Certain general points, concerning the nature of homopolar connections and paramagnetism in the transition metals, are developed in an additional section. (auth)

4697 CEA-786

France. Commissariat à l'Énergie Atomique, Paris.
PREMIERS ESSAIS MÉTALLURGIQUES SUR LE PLUTONIUM. (The First Metallurgical Tests on Plutonium.) E. Grison, R. Abramson, F. Anselin, and H. Monti. Jan. 1958. 50p.

Preliminary metallurgical tests made on several grams of plutonium are reported. The special apparatus and operating procedures necessary for studying the element are discussed. A dilatometric study and an x-ray-diffraction examination were made on small plutonium samples. The micrography of plutonium is discussed. (J.S.R.)

4698 CF-58-1-5

Oak Ridge National Lab., Tenn.
LITERATURE SEARCH ON BEARING MATERIALS COMPATIBILITY WITH FUSED SALTS. P. G. Smith. Jan. 2, 1958. Decl. Apr. 23, 1958. 16p. Contract [W-7405-eng-26]. $4.80(ph OTS); $2.70(mf OTS).

A literature search of bearing materials compatibility with fused salts reveals that the only work of significance on the subject was performed by Oak Ridge National Laboratory and Battelle Memorial Institute. The work at ORNL was comprised of dynamic compatibility of potential bearing materials immersed in fused salts at 1200°F. The materials selected for these tests were screened from corrosion tests. The work at BMI, somewhat more extensive than at ORNL, was comprised of static compatibility tests, dynamic compatibility tests, and actual sleeve-bearing tests of materials immersed in fused salts. The static compatibility tests and sleeve-bearing tests were performed with 1200°F fused salt, while the dynamic compatibility tests were performed with 1500°F fused salts. Potential valve sealing surface materials were screened from the work both at ORNL and BMI and tested in valves at ORNL in fused salts at various temperatures from 1000 to 1600°F. The dynamic compatibility work at ORNL consisted of testing 36 combinations of 10 different materials in fused salt at 1200°F. From these tests, the combinations performed best with regards to resistance to mechanical damage, such as wear, galling, and self-welding. (auth)

4699 CF-58-2-75

Oak Ridge National Lab., Tenn.
SYMPOSIUM ON ZIRCONIUM COSTS, SPONSORED BY THE COLUMBIA NATIONAL CORPORATION, FEBRUARY 13, 1958. J. A. Lane. Feb. 21, 1958. 6p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

A cost breakdown is given for stainless steel vs. zirconium in the Yankee Power Reactor. Zirconium production capacity is given for the U.S. along with zirconium prices. (W.L.H.)

4700 CRMet-796

Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.
EFFECTS OF ALLOYING ADDITIONS AND TEMPERATURE ON THE CORROSION OF ALUMINUM–NICKEL–IRON ALLOYS IN HIGH TEMPERATURE WATER. G. J. Biefer. July 1958. 50p. (AECL-691). $1.50 (AECL).

The corrosion resistance of a number of aluminum–nickel–iron alloys has been studied in static water at 260 to 350°C. Small additions of Ti, Zr, and Be were found to improve the corrosion resistance. The effect of increased nickel (demonstrated previously) and these minor additions was found to be additive, and the alloy of best corrosion resistance (AECL-10197) had the wt. % composition: Ni, 2.0; Fe, 0.5; Si, 0.2; Ti, 0.2; Zr, 0.05; and Be, 0.05. At 300°C, the static corrosion rate of 10197 was 0.5×10^{-3} inches/year. The significance of the results is discussed in terms of reactor technology and the mechanism of corrosion. (auth)

4701 DMIC-107

Battelle Memorial Inst. Defense Metals Information Center, Columbus, Ohio.
TENSILE PROPERTIES OF TITANIUM ALLOYS AT LOW TEMPERATURES. F. C. Holden, F. R. Schwartzberg, and H. R. Ogden. Jan. 15, 1959. 44p. Contract AF18(600)-1375. (AD-207911; PB-151062).

Information available to the Defense Metals Information Center on the tensile properties of titanium alloys at low temperatures is presented. Some of the important factors that affect these properties are alloy composition, interstitial content, and microstructure. Sensitivity to notches generally is increased as the temperature is lowered. Unalloyed titanium shows increased strength as the temperature is decreased. Ductilities are decreased at very low temperatures but remain adequate as low as −320°F. Low-temperature ductility is decreased by high interstitial content. For the alloys, reasonable ductilities at −320°F usually can be obtained, provided that the interstitial content is kept low. Ductility at low temperatures is higher for alloys when the microstructure is equiaxed, rather than transformed. Most of the alloys tested showed low ductility at −423°F. Excessive hydrogen causes a strain-rate-sensitive loss of ductility in the temperature range from −100 to 0°F. Notch sensitivity is increased as the temperature is lowered, and most of the factors that decrease ductility also increase notch sensitivity. These include high interstitial levels and transformed, or acicular, microstructures. Alloys heat treated to high strength levels generally are more notch sensitive than the same alloys in the annealed condition. (auth)

4702 IDO-16487

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.
RECORDING PROFILOMETER. T. J. Boland. Nov. 12, 1958. 19p. Contract AT(10-1)-205. $0.75(OTS).

The determination of nuclear radiation effects upon various materials constitutes a principal use of the MTR Hot Cell. The Recording Profilometer implements this facility by providing a means for studying the surface

characteristics of test samples, before and after irradiation. The Recording Profilometer described measures the profile and surface roughness of test samples. This is accomplished by scanning the length of the test sample with a single pickup transducer. The direct transducer output is displayed on the "profile" channel of a two-channel recorder while the differentiated transducer output is simultaneously displayed on the "roughness" channel of the recorder. (auth)

4703 ISC-1059

Ames Lab., Ames, Iowa.

ENTRAINMENT OF NON-VOLATILE SOLIDS IN SUBLIMATION AT REDUCED PRESSURE. Robert L. Skaggs and D. Peterson. Mar. 1958. 69p. Contract W-7405-eng-82. $2.00(OTS).

A fundamental analysis of some of the factors affecting entrainment in sublimation is proposed, and the predictions are verified experimentally by investigation of the separation of particulate silicon carbide from ammonium chloride. It was found that for the impurity particle size distribution studied increased system pressure is effective in reducing entrainment at a given mass rate of sublimation. The separation is also improved at a given pressure by sublimation at lower rate. The sublimation rate was found to be a function of temperature and pressure. The temperature necessary to initiate sublimation is approximately the temperature at which the vapor pressure of ammonium chloride is equal to the system pressure. Above this initiation temperature the sublimation rate increases linearly with temperature. Thorium tetrachloride of 200 ppm oxygen content is prepared by double sublimation at controlled pressure. In the second sublimation the vapor is passed through turnings of thorium metal to remove volatile metal chloride impurities. The purity of the thorium tetrachloride sublimed by this procedure was found to be much superior to that sublimed at low pressure under a dynamic vacuum. (auth)

4704 LA-1304

Los Alamos Scientific Lab., N. Mex.

THE NICKEL–PLUTONIUM SYSTEM. G. W. Wensch, D. D. Whyte, E. M. Cramer, F. H. Ellinger, F. W. Schonfeld, and V. O. Struebing. Mar. 1951. Decl. Aug. 7, 1958. 28p. Contract W-7405-eng-36. $4.80 (ph OTS); $2.70(mf OTS).

A tentative nickel–plutonium constitutional diagram was based on data obtained by thermal analysis, metallography, and x-ray-diffraction techniques. The system is a complex one with the following important features. Nickel is soluble in epsilon plutonium, extending the epsilon field to 4.3 at. % nickel at 465°C. Nickel and plutonium form six intermetallic compounds, PuNi, $PuNi_2$, $PuNi_3$, $PuNi_4$, $PuNi_5$, and $PuNi_9$. The compound $PuNi_5$ forms congruently from the melt at approximately 1300°C, whereas the other compounds form peritectically. The extended epsilon field terminates in a eutectoid reaction at 415°C and 1.5 at. % nickel. Epsilon plutonium and the compound PuNi form a eutectic system at 465°C with a eutectic composition of 12.5 at. % nickel. Nickel and the compound $PuNi_9$ form a eutectic system at 1210°C with a eutectic composition of 92 at. % nickel. Plutonium forms a limited solid solution with nickel. (auth)

4705 LMSD-2701

Lockhead Aircraft Corp. Missile Systems Div., Sunnyvale, Calif.

BERYLLIUM (BRUSH QMV PRESSED BLOCK): CREEP-RUPTURE PROPERTIES. Jay F. Burcham. Feb. 11, 1958. 28p.

The short-time creep-rupture properties of Brush QMV beryllium block, hot pressed at 1050°C, were investigated. Heating rates of 330 to 520°F/sec were used to reach final temperatures of 400, 850, 1100, 1300, and 1550°F. Stress levels were 30, 60, and 90% of the nominal yield strength of the material at the various test temperatures investigated. Resistance heating methods were used. Strain characteristics during heating and at temperature varied consistently over the range of temperatures and stresses investigated. A maximum testing time-span of 2 min at temperature was observed for the tests. Where failure occurred, the rupture times varied erratically. (auth)

4706 LMSD-4009

Lockheed Aircraft Corp. Missile Systems Div., Sunnyvale, Calif.

TENSILE PROPERTIES OF BRUSH BERYLLIUM QMV MATERIAL AT ROOM AND ELEVATED TEMPERATURES. Jay F. Burcham. Dec. 12, 1957. 36p.

The following tensile properties of Brush Beryllium QMV material, vacuum hot pressed at 1050°C, are reported for temperatures ranging from 70 to 1600°F: yield strength, ultimate strength, modulus of elasticity, percent elongation, and stress-strain relationship to 5% elongation. A unique method for obtaining strain measurements is described. Only one or two specimens were used for each temperature and the coupon configurations governed the testing methods. Because of this, the test results, while accurate, were based on insufficient samplings to establish representative material properties. With the exception of the modulus of elasticity, which showed variations, the general behavior of the material was similar to that previously reported. A detailed comparison of test results with those in other published data is impossible because chemical composition, mesh, compacting pressure, machining procedures, and type of surface finishing treatment are not defined for the beryllium materials discussed. (auth)

4707 MND-DB-2524

Martin Co. Nuclear Div., Baltimore.

DEVELOPMENT OF IRON–ALUMINUM BASE ALLOY FOR GAS COOLED REACTOR COMPONENTS. Quarterly Progress Report No. 4 for September through November 1958. Frank Tate. Dec. 1958. 49p. Contract AT(30-3)-325. $7.80(ph OTS); $3.30(mf OTS).

Iron–aluminum base alloys are considered for use in gas-cooled reactor applications because of their low thermal neutron capture cross sections and excellent oxidation resistance. The optimization experiment has shown that the optimum alloy, considering only ductility and oxidation resistance, is in the region of three per cent Nb and ¾ to 1½% Zr addition to a base alloy of 7½ wt. % Al–5 wt. % Cr–bal. Fe. An investigation showed that DB-2 (7 wt. % Al–5 wt. % Cr–0.5 wt. % Ti–1 wt. % Nb–bal. Fe) can be air melted without an appreciable change in yield and ultimate strength and per cent elongation. A fine-grain equiaxed cast structure can be obtained in DB-2 by pouring it at a melt temperature of ~2800°F into a cold mold. Preliminary work indicates that Fe–Al alloys can be adapted to conventional hot-roll bonding techniques and brazing procedures. (W.L.H.)

4708 MND-E-1602

Martin Co. Nuclear Div., Baltimore.

AUTOCLAVE TESTING OF TYPE 430 STAINLESS STEEL. TASK I, PHASE 2-b. J. W. McGrew. Jan. 1959. 25p. Contract DA-44-009-ENG-3043.

Type 430 stainless steel U-bend specimens are not susceptible to stress corrosion cracking when stressed and exposed to an environment containing up to 100% O_2, chloride concentrations to 1,100 ppm Cl, pH adjusted to 11.5 with NaOH, a temperature of 400°F, and periods up to 1,176 hours in a rocker-type autoclave. Additionally, cracking did not occur under the severe exposure of Type 430 stainless steel U-bend specimens subjected to magnesium chloride at 1,030 ppm as Cl. Further, Type 430 stainless steel is susceptible to pit corrosion under certain environmental conditions typified by a greater than 100 ppm Cl concentration combined with about 20% oxygen. The pitting corrosion is a typical chloride attack. Therefore, the modified alloy, Croloy 16-1, with its increased nickel content will resist stress corrosion cracking under these test conditions and it also may not suffer pitting corrosion. It has previously been shown that stress corrosion cracking of Type 430 does occur in certain environmental conditions which usually include low pH. (auth)

4709 NAA-SR-2776

Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.

MODERATOR GRAPHITE EXPERIMENTS IN THE SRE. R. E. Taylor. Nov. 15, 1958. 33p. Contract AT(04-3)-49. $1.00(OTS).

The graphite moderator in the Sodium Reactor Experiment is subjected to high fluxes at temperatures ranging from 500 to 1000°F. The amount and composition of gases desorbed, changes in thermal conductivity, and dimensional changes resulting from exposure under these conditions is desired for future design concepts. The experimental approach and equipment designed to measure the above changes are described in detail, and the results obtained during the preliminary low-level power runs are presented. (auth)

4710 NAA-SR-2798

Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.

THE FINISHING AND INSPECTION OF URANIUM FUEL SLUGS IN THE PROCESSING REFABRICATION EXPERIMENT. J. Guon, J. R. Foltz, and W. Cockrell. Dec. 15, 1958. 65p. Contract AT(11-1)-GEN-8. $1.75 (OTS).

Methods of remote finishing and inspection of cast, radioactive, Sodium Reactor Experiment-type fuel elements were investigated. Cold short fracture, abrasive, electrical discharge, and ultrasonic methods of machining were studied. Mechanical and optical methods of dimensional inspection were investigated. Subsurface porosity effects were analyzed. Radiographic and ultrasonic techniques were used. (auth)

4711 NAA-SR-3170

Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.

DIFFUSION OF BERYLLIUM IN BERYLLIUM OXIDE. Stanley B. Austerman. Dec. 15, 1958. 22p. Contract AT-11-1-GEN-8. $0.75(OTS).

The self-diffusion of Be in polycrystalline BeO was determined with radioactive Be^7 at temperatures between 1570 and 1934°C. Following diffusion anneal, the samples were sectioned by grinding, and the one-dimensional diffusion-penetration of Be^7 was determined by counting procedures. The data can be fitted by two straight lines on a log D vs. 1/T graph. The temperature region 1570 to 1730°C was fitted by $D = 5.56 \times 10^3 \exp(-111{,}600/RT)$. The region 1730 to 1934°C was fitted by $D = 6.14 \times 10^{-2} \exp(-66{,}100/RT)$. There was no evidence of grain-boundary diffusion. (auth)

4712 NASA-M-11-21-58W

California Inst. of Tech., Pasadena.

EFFECT OF REST PERIOD ON FATIGUE OF HIGH-PURITY ALUMINUM. J. W. Berry, J. Lemaitre, and S. R. Valluri. Dec. 1958. 21p.

Tests on aluminum specimens were performed under two conditions. In one the specimens were tested at elevated temperatures and the rest periods were given at room temperature; in the second the specimens were tested at room temperature and the rest periods were given at elevated temperature. The results obtained indicated that the increase of life was negligible in the first condition but that an increase of life may be obtained in the second. In order to check this increase in fatigue life, a second series of tests was carried out on a different lot of specimens and again an increase in life was found. This increase of life appeared to be 30 to 60%. (auth)

4713 NMI-1205

Nuclear Metals, Inc., Concord, Mass.

A PRELIMINARY STUDY OF HIGH-STRENGTH ZIRCONIUM-BASE ALLOYS. S. R. Maloof. Aug. 1, 1958. 36p. Contract AT(30-1)-1565. $1.00(OTS).

Unalloyed uranium can be clad with zirconium-base alloys heat treatable to tensile strengths around 200,000 psi with elongations of about 6%. Indications are that high-strength zirconium-base claddings do restrain the growth of unalloyed uranium in thermal cycling between room temperature and 550°C (1020°F). (auth)

4714 NP-7117

Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.

INVESTIGATION OF HIGH TEMPERATURE RESISTANT MATERIALS. Summary Report No. 2 [for] November 1, 1957 to October 31, 1958. C. R. Mason and J. D. Walton. 113p. Project No. A-212. Contract NOrd-15701.

Preliminary tests were made on the effects of particle size and substrate temperature on the adherence of 3.5-mil flame-spray coatings on mild steel using 85% ZrO_2–15% TiO_2 powder. Two materials were investigated as possible base coats for flame-sprayed Al_2O_3. One material, consisting of a 70% Al–30% Al_2O_3 mix, provided excellent room temperature adherence when it was oversprayed with Al_2O_3 and resisted spalling after cooling from 1700°C. The other base material, copper, also provided excellent room-temperature adherence when oversprayed with Al_2O_3 but spalled severely when cooled from 1500°F. Exploratory work on coatings produced from flame-sprayed TiO_2 showed excellent room-temperature adherence. The effects of the ratio of thermite mix to throttling agent and the effect of the shrouding material used during ignition were studied in connection with zirconium disilicide. The thermite reaction between Al and fused Si was considered as a possible means of bonding a high silica body. Cermets containing zirconium carbide and titanium carbide were produced by thermite reactions. Investigations on various throttling materials for thermite reactions are presented. The change in free energy for thermite reactions of Be with 13 metal oxides was calculated. The general equation for these reactions is: Be + Mo → BeO + M + Heat. The 13 oxides which were considered were SiO_2, Cr_2O_3, NiO, WO_3, MoO_3, Fe_2O_3, Co_3O_4, MnO, TiO_2,

ZrO_2, V_2O_5, HfO_2, and Al_2O_3. Tests were made on the rocket nozzle test facility to standardize operating procedures. Nozzles fabricated using the thermite reaction between fused silica and aluminum were too weakly bonded to withstand the physical shock of the start cycle on the small rocket test stand. Nozzles fabricated using the zirconium carbide forming thermite reaction melted rapidly when tested on the small rocket motor. Nozzles containing 85% silica–15% graphite, pressed to 17,500 psi, continued to give the best performance of all silica nozzles tested. (For preceding period see NP-6546.) (W.L.H.)

4715 NP-7141

Brussels. Centre d'Étude de l'Énergie Nucléaire.
INSPECTION ET CONTROLE NON DESTRUCTIFS DES ELEMENTS DE COMBUSTIBLES POUR REACTEURS NUCLEAIRES. (Inspection and Non-destructive Testing of the Fuel Elements for Nuclear Reactors.)
E. Jonckheere. Feb. 3, 1958. 23p.

To show the inspection and testing techniques involved in nuclear fuel fabrication, the methods applied to BR-2 reactor fuel elements are described. Chemical, radiographic, ultrasonic, fluoroscopic, and autoradiographic methods are described. (T.R.H.)

4716 NP-7164

Brussels. Centre d'Étude de l'Énergie Nucléaire.
SIMULATION DE LA PRODUCTION DE CHALEUR DANS L'URANIUM. CHAUFFAGE DE TUBES EN GRAPHITE PAR EFFET JOULE. (Simulation of the Production of Heat in Uranium. Heating of Tubes in Graphite by the Joule Effect.) P. Marien. Mar. 1958. 22p.

An experimental loop is being constructed to study cooling by pressurized gas. To simulate in a laboratory the high calory flux existing in the uranium in a reactor of the Calder Hall type, different methods of possible heating were compared. Heating by hot fluids, by the Joule effect on graphite tubes, and by the Joule effect on stainless steel tubes was studied. The graphite heating element was selected. In a series of preliminary tests studies were made on the best form to give the graphite-graphite and copper-graphite contacts to assure as low a potential drop as possible. The electrical isolation between the aluminum sheaths and the graphite heating element, the oxidation of graphite, the difference in the expansion of the graphite element and the aluminum sheaths, the variation of the resistivity of graphite caused by the thermal cycling, and the effect of temperature on the graphite resistivity were also investigated. Methods for a continuous measurement of the internal temperature in the graphite and of the distribution of heat production along the length of the heating element were studied. (J.S.R.)

4717 NP-7168

Brussels. Centre d'Étude de l'Énergie Nucléaire.
PREPARATION D'ALLIAGE ALUMINIUM–URANIUM PAR REDUCTION D'UN SEL D'URANIUM DANS LE BAIN D'ALUMINIUM. RAPPORT TRIMESTRIEL D'AVANCEMENT. (Preparation of Aluminum–Uranium Alloys by Reduction of a Uranium Salt in an Aluminum Bath. Tri-monthly Progress Report.) J. J. Huet. June 26, 1958. 9p.

A method is given for preparing Al–25 wt. % U alloy by reducing UF_4 mixed with twice its weight in cryolite using Na and Li as reducers. Yields of 92 and 99%, respectively, for Na and Li were obtained. Reduction by Li is recommended because of the higher yield, safer reaction, and lack of contamination of the product alloy. (T.R.H.)

4718 NP-7202

Koppers Co., Inc., Pittsburgh.
HIGH TEMPERATURE GAS-CIRCULATION LOOP FOR TESTING REACTOR SYSTEM COMPONENTS. July 1957. 45p.

Development of equipment for high-temperature reactors will require non-nuclear testing facilities that simulate fluid flow conditions of the reactors. This conceptual design for a possible high-temperature gas circulation loop describes experiments and loop components. Temperatures to 3000°F and flow rates to 500 cu. ft/min. at 50 psia pressure would be reached in testing gas-cleaning equipment, heat exchangers, and other equipment. The loop would be built using new materials and methods such as KT silicon carbide tubing which can be welded into complex forms. Cost of the loop, using developmental prices for such materials, would be approximately $560,000. (auth)

4719 SCDC-798
SCDC-797

Texas. Univ., Austin. Structural Mechanics Research Lab.
STRESS-STRAIN CHARACTERISTICS OF MATERIALS AT HIGH STRAIN RATES. PART I. DISPLACEMENT MEASUREMENTS DURING HIGH-VELOCITY IMPACTS. Donald Paul Fitzgibbon. July 15, 1958. PART II. EXPERIMENTAL RESULTS. E. A. Ripperger. Aug. 29, 1958. (Pt. I, 102p. (SCDC-798) and Pt. II, 153p. (SCDC-797)). For Sandia Corp. Contract AT(29-2)-621. (SCDC-798, $16.80(ph OTS); $5.70(mf OTS) and SCDC-797, $24.30(ph OTS); $7.50(mf OTS)).

These two reports were issued separately, but are cataloged as a unit.

A photoelectric method for measuring displacements during high-velocity impacts is described. The theory of the system is discussed in detail, and a prototype system which was built and tested is described. The performance of the prototype system is evaluated by comparing the results which it gives with results obtained by other methods of measurement. The system was found capable of a resolution of at least 0.01 inches. Static and dynamic stress-strain characteristics of seven high polymers, polyethylene, teflon, nylon, tenite M, tenite H, polystyrene, and saran, plus three metals, lead, copper, and aluminum, are described and compared by means of stress-strain curves and photographs. Data are also presented which show qualitatively the effects produced on stress-strain characteristics by specimen configuration, temperature, and impact velocity. It is shown that there is a definite strain-rate effect for all these materials except polystyrene. The effect is one of an apparent stiffening of the material with increasing strain rate, which is similar to the effect produced by lowering the temperature. The stress-strain measurements are examined critically, inconsistencies are pointed out, and possible sources of error suggested. Values of yield stress, modulus of elasticity and energy absorption for all materials (except copper and aluminum), specimen configurations, temperatures, and impact velocities included in the investigation are tabulated. (auth)

4720 SSC-110

Naval Ordnance Lab., White Oak, Md.
THE INVESTIGATION OF RADIOISOTOPES FOR THE INSPECTION OF SHIP WELDS. Progress Report No. 1. E. L. Criscuolo, D. P. Case, and D. Polansky. Feb. 28, 1958. 62p. Project SR-127.

A study was conducted that explored the potentialities

of radioactive isotopes for the inspection of welds in ship structures. Various parameters were investigated to determine an optimum radiographic technique for the inspection of hull welds of ½- to 2-inch plate. Techniques and sensitivity curves for thulium, iridium, cesium, and cobalt are included. For the inspection of welds in ½- to 1-inch thick plate, iridium is the most promising isotope. A portable exposure container for iridium has been developed. (auth)

4721 WADC-TN-58-176
Case Inst. of Tech., Cleveland.
DELAYED FAILURE AND NOTCH TENSILE PROPERTIES OF A VACUUM MELTED 4340 STEEL.
P. Blanchard and A. R. Troiano. Sept. 1958. 22p. Project No. 7021. Contract AF33(616)-3431. (AD-204791).

The influence of vacuum melting on the notch tensile and delayed failure properties of a 4340 steel was investigated. The notch ductility and the notch tensile strength of the vacuum-melted 4340 steel are greater than those of electric-furnace-melted 4340 steels at the high strength levels. The vacuum-melted 4340 steel at the high strength levels is also less susceptible to delayed failure than the standard melted 4340 steel. (auth)

4722 WADC-TR-56-423(Pt. II)
Library of Congress. Technical Information Div., Washington, D. C.
THERMAL PROPERTIES OF CERTAIN METALS. PART II. IRON, BERYLLIUM, IRIDIUM, PALLADIUM, PLATINUM, AND TUNGSTEN. Period Covered: July 1, 1956 to December 31, 1957. Thomas C. Goodwin, Jr. and Mauree W. Ayton. Jan. 7, 1958. 321p. Project No. 2998. Contract AF33(616)-55-10. (AD-157169).

The bibliography on the thermal properties of certain metals consists of references, with abstracts, to pertinent open literature published from 1920 to 1957 and to unclassified reports issued from about 1944 to 1957. These references were obtained by a comprehensive search of the listed sources. Material included in the bibliography pertains to various thermal properties, namely, heat capacity, thermal conductivity, emissivity, thermal diffusivity, and thermal expansion of iron (pure), beryllium, iridium, rhodium, palladium, platinum, and tungsten. (auth)

4723 WADC-TR-58-72
Columbia Univ., New York.
VARIOUS ASPECTS OF THE DISTRIBUTION OF FATIGUE LIVES. Period covered: February 1 to June 30, 1957. E. J. Gumbel. Apr. 1, 1958. 45p. Project title: MATERIALS ANALYSIS AND EVALUATION TECHNIQUES. Task title: FATIGUE PROPERTIES OF STRUCTURAL MATERIALS. Contract AF33(616)-2274. (AD-155747; PB-151211). $1.25(OTS).

The following aspects are presented of the asymptotic probability function of limited smallest values that is being used for the representation and interpretation of both constant stress-amplitude and random fatigue tests and for the estimate of the minimum fatigue life: transformation of the probability functions for large values of the scale parameter; probability function for the relative life defined as the fatigue life divided by the characteristic value; relation between scale-parameter and minimum life; and nomograms for the rapid estimation of the parameters of the probability function. (auth)

4724 WADC-TR-58-181
Horizons, Inc., Cleveland.
A RESEARCH PROGRAM ON THE INVESTIGATION OF SEAL MATERIALS FOR HIGH TEMPERATURE APPLICATION. Period covered: January 1, 1957 through March 31, 1958. Raymond H. Baskey. Apr. 1, 1958. 73p. Project title: CERAMIC AND CERMET MATERIALS. Task title: CERAMIC AND CERMET MATERIALS DEVELOPMENT. Contract AF33(616)-3891. (AD-155689).

Novel rotating-seal materials for potential aircraft applications at high speed and high temperatures were developed and tested under conditions of no external lubrication. These materials were arrived at after a systematic study of the wear behavior of pure refractory metals, binary alloys of refractory metals bonded with nickel, and ternary alloys of refractory metals bonded with nickel and infiltrated with silver. Tests were conducted to determine the benefit derived from additions of nickel or silver to the refractory hard metals. The nickel acts as a tough, oxidation-resistant matrix. The silver was added to act as a lubricant as it softens at high temperatures. This aids the shearing action between mating surfaces and lowers the surface friction. Two ternary alloys prepared by powder metallurgy techniques and consisting of high percentages by weight of a refractory hard metal, with nickel and silver additions, show superior wear qualities when run against either tool steel or Inconel. Tests were made at sliding speeds of 30,000 fpm and ambient temperatures up to 1350°F. The best alloys contained either tungsten boride (WB) or chromium nitride (CrN) as the hard refractory metal. The WB alloy exhibited a constant wear rate at all temperatures against tool steel. The wear rate of the CrN alloy decreased at the higher temperatures. All ternary alloys run against Inconel displayed a decrease in wear rate at ambient temperatures over 600°F. The wear decreased as a function of temperature for several ternary alloys against tool steel. An unimpregnated graphite seal coated with an oxidation resistant layer of zirconium carbide showed improved wear properties over a regular graphite impregnated seal at an ambient temperature of 1050°F and sliding speeds of 14,000 fpm against stainless steel type 303. The finest wear performance was attained when Kentanium K162B ran against Kentanium K162B at sliding speeds of 14,000 fpm in an ambient temperature of 1100°F. It is hypothesized that the wear process is drastically influenced by the oxidation occurring on the rubbing surfaces and that with proper choice of materials, stable, complex oxides are formed which provide the correct solid lubricating film on each component and markedly lower the wear rate as the temperature is increased. (auth)

4725 WADC-TR-58-275(Pt.I)
Bausch and Lomb Optical Co., Rochester, N. Y.
FABRICATION OF INFRARED TRANSMITTING MATERIALS BY HOT PRESSING TECHNIQUES. Period covered: April 1, 1957 to March 31, 1958. Norbert J. Kreidl, Harold C. Hafner, Joseph R. Hensler, and Eugene C. Letter. Aug. 8, 1958. 170p. Project title: CERAMIC AND CERMET MATERIALS. Task title: CERAMIC AND CERMET MATERIALS DEVELOPMENT. Contract AF33(616)-5123. (AD-202844).

The fabrication of infrared-transmitting materials by hot-pressing techniques was studied. BaF_2 was used as a model material. The temperatures studied ranged from 600 to 1225°C and the pressures from 1500 to

8000 psi. The equipment used to obtain these conditions is described. The effects of various hot-pressing atmospheres including nitrogen, helium, argon, and carbon dioxide were investigated. A study was carried out to identify the impurities present and to study their effects. (auth)

4726 WADC-TR-58-395
National Carbon Co. Research Labs., Cleveland.
FURTHER STUDIES OF GRAPHITE-BASED MATERIALS FOR HIGH TEMPERATURE APPLICATIONS. M. Janes. July 3, 1958. 24p. Project title: ATLAS MATERIALS. Task title: GRAPHITE-BASED MATERIALS FOR HIGH TEMPERATURE APPLICATIONS. Contact AF33(616)-3537. (AD-204216).

Results are summarized of a continuing program to study the behavior of graphite- or carbon-based materials under conditions of exposure to high heat flux with consequent high surface temperatures at high relative gas-flow rates of an oxidizing gas. Materials which showed promise in earlier work previously reported have been more intensively studied and tested at higher relative air-flow rates. Carbon and graphite materials prepared with normal variations in carbon technology, such as the raw materials for filler component and binder, particle sizing, method of forming, etc., continue to show relatively minor differences in oxidation-erosion rate. Materials of promise, even under the relatively more severe conditions of air-flow rate, include graphite coated with pyrolytic carbon, graphite impregnated with AlF_3, and graphite coated with silicon carbide or silicon nitride. Combinations of graphite with carbides, such as boron carbide and silicon carbide, with the carbide incorporated throughout the body, show substantially improved oxidation-erosion resistances at the more severe conditions of high relative air-flow rate. However, comparatively poorer behavior is to be anticipated at surface temperatures above about 1700°C. (auth)

4727 WADC-TR-58-457(Pt. I)
Alloyd Research Corp., Watertown, Mass.
RESEARCH ON TECHNIQUES FOR THE PRODUCTION OF ULTRA-PURE BERYLLIUM. Period covered: July 1, 1957 to June 30, 1958. Joseph L. Lukesh, Laurence McD. Schetky, Henry S. Spacil, and Malcolm Basche. Aug. 1958. 43p. Project title: METALLIC MATERIALS. Task title: BERYLLIUM AND BERYLLIUM ALLOYS. Contract AF33(616)-5300.

The brittleness problem of beryllium is described, and the empirical and theoretical approaches to its solution are discussed. The Alloyd Research Corporation program for the production of very high-purity beryllium is described in detail. Experimental results are outlined, conclusions are drawn, and recommendations for future work are presented. (auth)

4728 WADC-TR-58-507
California. Univ., Berkeley. Minerals Research Lab.
THE EFFECT OF STRESS ON THE CREEP BEHAVIOR OF HIGH PURITY ALUMINUM IN THE REGION OF DISLOCATION CLIMB. Technical Report No. 2. A. Bayce, W. Ludemann, L. A. Shepard, and J. E. Dorn. Aug. 6, 1958. 34p. Project title: MATERIALS ANALYSIS AND EVALUATION TECHNIQUES. Task title: FATIGUE AND CREEP OF MATERIALS. Contract AF33(616)-3860.

The effect of stress on the creep rate in the dislocation climb region was investigated by increasing and decreasing the stress abruptly during the course of primary creep of high-purity aluminum. These investigations revealed that a simple functional relationship between creep rate and stress does not exist; the effect of stress on the creep rate depended on the substructure as well as the stress. In general the creep of aluminum under conditions of changes in stress can be resolved qualitatively in terms of dislocation climb models for creep. (auth)

4729 WAPD-ZH-12
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
ZIRCONIUM HIGHLIGHTS. Nov. 1958. 25p. Contract AT-11-1-GEN-14. $4.80(ph OTS); $2.70(mf OTS).

Experiments were performed to determine the composition and characteristics of stringers in Zircaloy-2 using argon atmosphere arc-melted material in the form of tube sections. This material had been previously annealed for 3 hr at 750°C after tube reduction. During production testing of reactor fuel elements a defect was encountered which consisted of three small "bumps" near the front end of the extrusion. The defect was the result of the Zircaloy-2 melting operation. The defect consisted of tin-rich hard particles which oxidized during the final corrosion test. Vacuum annealing Zircaloy-2 material for H_2 removed at 750°C, subsequent to a cold rolling operation, has resulted in occasional cases of excessive grain growth. A study was undertaken to determine the conditions which affected the growth of these grains and methods by which the growth of these grains can be controlled. Zircaloy-2 cruciforms having 5-inch span and a 0.300-inch blade thickness have been successfully extruded. No jacketing was used on the billet. The reduction ratio was 8.4 to 1. (For preceding period see WAPD-ZH-11.) (W.L.H.)

4730 YAEC-84
Westinghouse Electric Corp. Atomic Power Dept., Pittsburgh.
PROGRESS IN THE DEVELOPMENT OF A PROCESS FOR PRODUCING UO_2 PELLETS. R. Winchell. Dec. 1958. 44p. For Yankee Atomic Electric Co. Contract AT(30-3)-222, Subcontract No. 1. $7.80(ph OTS); $3.30(mf OTS).

Progress in the development of manufacturing procedures and techniques for uranium dioxide fuel pellets is described. Specifications for both the uranium oxide powder and the final fuel pellet are given. A process is described for making pellets with closely controlled density, dimensions, purity, and freedom from structural defects from ADU (ammonium diuranate process) uranium dioxide powder. A formula relating linear shrinkage to green and fired densities has been derived. This formula has proven a useful tool in control of fired or sintered pellet dimensions and densities. An example of the use of this formula is given. Processes described were utilized in the manufacture of pellets for use in critical experiments. Improvements in processing continue to be developed. (auth)

4731 AEC-tr-3503
STUDY OF URANIUM–ZIRCONIUM DIFFUSION. (Etude de la Diffusion Uranium–Zirconium.) Y. Adda, C. Mairy, and P. Bouchet. Translated by Liz Appleby (Hanford Atomic Products Operation) from Report CEA-672, Feb. 1957. 35p.

The coefficients of diffusion of uranium–zirconium in the gamma phase (body-centered cubic) were determined. The Kirkendall effect was demonstrated and was considered as an argument in favor of the generality

of the diffusion mechanism by vacancies in metals with body-centered cubic lattices. The experimental techniques are described, and the diffusion coefficient calculations are presented. It is concluded that the excess of vacancies which accompany the Kirkendall effect is too small to explain the variations in the diffusion coefficient with concentration. A study, at constant concentration, of the diffusion coefficient as a function of the chemical gradient would verify these ideas. (J.R.D.)

4732 AEC-tr-3516

ON THE STRUCTURE OF MOLTEN BISMUTH–TIN ALLOYS. N. V. Alexeyev and Ya. I. Gerasimov. Translated by S. J. Rothman (Argonne National Lab.) from Doklady Akad. Nauk S.S.S.R. 121, 488-91(1958). 6p.

The Bi–Sn system was examined by using an electronograph which was adapted for work at high temperatures. Pictures were taken at 290°C, and radial distribution curves were constructed from these by the usual methods. Incoherent scattering was not compensated for. The literature values of the densities of Bi–Sn alloys were used for calculating the number of atoms per unit volume, and the radial distribution curves calculated are presented graphically. (J.R.D.)

4733 AEC-tr-3522

USE OF BROMINE IN ELECTRON METALLOGRAPHY. G. Henry, J. Plateau, and J. Philibert. Translated by K. S. Bevis (Savannah River Lab.) from Compt. rend. 246, 2753-6(1958). 5p.

The use of bromine, together with direct carbon replicas, as an agent to dissolve ferrous alloy matrices for preparing objects in electron metallography is examined. In addition, the separation of replicas, methods of extraction, and analysis of precipitates and inclusions are discussed. (auth)

4734 AEC-tr-3523

ON THE BORIDES OF RHENIUM. V. S. Neshpor, U. B. Paderno, and G. V. Samsonov. Translated by N. H. Krikorian and A. Skumanich (Los Alamos Scientific Lab.) from Doklady Akad. Nauk S.S.S.R. 118, 515-16 (1958). 5p.

The compositions of the phases of rhenium–boron alloys were investigated. The following compounds were found: Re_4B, Re_2B, Re_3B_2, ReB, Re_3B_4, Re_2B_3, ReB_2, and Re_2B_5. The alloys were prepared by sintering pressed mixtures of powders of rhenium and boron in a vacuum laboratory furnace on blocks of boron carbide at 1900°C for 0.5 to 2 hr. The starting powder contained 99.966% Re and insignificant quantities of impurities: 0.008% K; 0.006% Na; 0.013% Ca; 0.003% Fe; 0.001% Al; 0.001% Cu; 0.003% Ni. The boron powder was obtained by vacuum purification by the induction heating of amorphous boron and contained 99.8% B. (auth)

4735 CEA-tr-A442

PROPRIÉTÉS DES ACIERS RÉSISTANT À LA CHALEUR SOUMIS AUX ESSAIS DE LONGUE DURÉE À DES TEMPERATURES DE 500° À 700°C. (Properties of Heat Resistant Steels During Extended Tests at Temperatures from 500° to 700°C.) A. Krisch. Translated from Arch. Eisenhüttenw. 28, 305-10(1957). 16p.

The deformation produced in the texture of some austenitic and ferritic steels by an extended stress at temperatures from 500 to 700°C was studied by means of electrolytic separation, microanalysis, and x-ray diffraction patterns of the electrolytic deposit. The results obtained are graphed and discussed. (J.S.R.)

4736 CEA-tr-A444

ETUDES AU MICROSCOPE ELECTRONIQUE DE STRUCTURES SUBCRISTALLINES SUR DES SURFACES D'ALUMINIUM BRILLANTEES CHIMIQUEMENT. (Electron Microscopic Study of the Subcrystalline Structures on Aluminum Surfaces Chemically Polished.) D. Altenpohl and W. Hugi. Translated from Aluminium 33, 774-81(1957). 31p.

It is shown, by electron microscopic studies, that the subcrystalline structure of Al subjected to a chemical brightening process depends in a systematic way on the position of the plane of observation of the lattice of the metal, the purity of the Al, and the cold formation and heat treatment. Since the subcrystalline structure appearing on the inside of grains shows, for the most part, irregularities of about 1 μ, it seems reasonable to suppose that it is connected with the images of the subgrains of Al. (T.R.H.)

4737 CEA-tr-R507

PERFECTIONNEMENT DE LA MÉTHODE DE DÉTERMINATION SIMULTANÉE DES CONDUCTIVITÉS THERMIQUE ET ÉLECTRIQUE DES ACIERS. (Perfecting of a Method for the Simultaneous Determination of the Thermal and Electric Conductivity of Steels.) R. E. Krshizhanovskii (Krjijanovsky). Translated by I. Melnick from Zavodskaya Lab. 23, 925-7(1957). 6p.

A method for the simultaneous determination of the thermal and electric conductivity of steels, which is based on the determination and distribution of the temperature and potential on the sample traversed by an electric current, is discussed. The equations for the calculation of these quantities are given. The sources of error and methods for eliminating them are discussed. A sketch of the apparatus used is given. (J.S.R.)

4738 NP-tr-212

STUDY OF ALUMINIUM–TANTALUM PHASE DIAGRAM. V. M. Glazov, M. V. Mal'tsev, and Yu. D. Chistyakov. Translated from Izvest. Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk, No. 4, 131-6(1956). 6p.

From the investigations carried out, an approximate sketch of the phase diagram of aluminum with tantalum can be given. The type of diagram can be classed as peritectic since the temperature of non-variant equilibrium lies above the temperature of conversion of pure aluminum. The liquidus line is shown. On the basis of microscopical and thermal analysis of alloys, it has been established that a peritectic reaction $TaAl_3 + L \rightarrow \alpha$ occurs at a temperature of 668 to 669°C in aluminum–tantalum alloys. X-ray analysis shows that tantalum is soluble in aluminum up to 0.25% in the solid state, and the solubility is not significantly reduced by lowering the temperature. As a result of the investigations a first approximation outline is given for the aluminum corner of the aluminum–tantalum phase diagram. (auth)

4739

TURBULENT HEAT TRANSFER INSIDE TUBES AND THE ANALOGY AMONG HEAT, MASS, AND MOMENTUM TRANSFER. W. L. Friend and A. B. Metzner (Univ. of Delaware, Newark). A.I.Ch.E. Journal 4, 393-402(1958) Dec.

The effect of fluid physical properties on the rates of convective heat transfer (or mass transfer) to Newtonian fluids flowing turbulently inside tubes has been studied extensively but never resolved for a wide range of variables. In the absence of precise experimental data the conflicting predictions of the many semitheoretical ap-

proaches developed during the last two decades have served to confuse rather than to clarify the basic question. To extend the range of the available data an experimental heat transfer study of the heretofore undefined region of high Prandtl number was performed. Fluid properties, determined experimentally, represented a variation in Prandtl number from 50 to 600. For final correlation all the available data for heat transfer with moderate temperature differences except those on liquid metals were considered. The effect of the Prandtl number for the range of the data (N_{Pr} of 0.50 to 600) was not well represented by any of the generally accepted theories or empirical equations, although a semitheoretical correlation was deduced from the data with Reichardt's general formulation of the analogy between heat and momentum transfer. The resulting equation fits all the available data with a standard deviation of 9.4%. The applicability of the correlation to turbulent mass transfer in tubes is demonstrated for Schmidt numbers up to 3,000. (auth)

4740

THE OXIDATION OF ZIRCONIUM AT HIGH TEMPERATURES AND THE STRUCTURE OF THE PRIMARY OXIDE LAYERS. E. S. Sarkisov, N. T. Chebotarev, et al. Atomnaya Energ. 5, 550-3(1958). (In Russian)

Several stages of zirconium oxidation in oxygen and water vapor were observed at 150 to 800°C. A fine layer of cubic structure and high passivity appears in the first stage, followed by a texturized monoclinic modification right under the cubic structure. In the last stage the black layer of cubic and monoclinic structure is replaced by a white film, followed by a sharp increase in the oxidation rate. The high corrosion resistance of the black zirconium film is related to the texturized solid solution of zirconium in ZrO_2. (tr-auth)

4741

AN INVESTIGATION OF THE Kβ-GROUP OF THE MANGANESE X-RAY SPECTRUM IN Mn–Ni ALLOYS. V. A. Kazantsev (Shevchenko Lugansk State Pedagogical Inst.). Doklady Akad. Nauk S.S.S.R. 123, 449-52(1958) Nov. 21. (In Russian)

Effects of composition, temperature, and magnetic transformations in Mn–Ni alloys on the shape, width, intensity, and length of the manganese $K\beta_5$ band were investigated. (R.V.J.)

4742

ON THE NATURE OF SOLID SOLUTIONS OF BORON IN ALPHA IRON. A. K. Shevelev (Labachevskii Gor'kii State Univ.). Doklady Akad. Nauk S.S.S.R. 123, 453-6 (1958) Nov. 21. (In Russian)

The crystalline lattice period and density were studied on single-phase solid solutions of iron and boron alloyed in a high-frequency furnace. Measurements and calculations of the α lattice constants in relation to boron content are tabulated. Geometric calculations, the observed diminishing of crystalline lattice period and density, and the changes in the intensity of the interfering lines on the x-ray picture indicate that boron, while dissolving in α iron, forms a solid solution replacement. (R.V.J.)

4743

THE BEHAVIOR OF ANTIMONIDES OF ALUMINUM, GALLIUM, AND INDIUM IN THE LIQUID STATE. V. M. Glazov and A. A. Vertman (Baikov Inst. of Metallurgy, Academy of Sciences, USSR). Doklady Akad. Nauk S.S.S.R. 123, 492-4(1958) Nov. 21. (In Russian)

The temperature dependence of magnetic susceptibility of Al, Ga, and In antimonides in the liquid state was studied, and the data obtained are compared with the thermodynamic and kinetic properties. (R.V.J.)

4744

EFFECTS OF HYDROGEN ON THE STRUCTURAL CHANGES IN TITANIUM ALLOYS. N. I. Block, A. I. Glazova, N. F. Lashko, and A. M. Yakimova. Izvest. Akad. Nauk S.S.S.R. Otdel. Tekh. Nauk No. 12, 96-9-(1958) Dec. (In Russian)

The complex phase analysis of the effects of hydrogen on the structural changes of VT3 and VT3-1 alloys (with 4.9 wt. % Al and 2.78 wt. % Cr; and 4.6 wt. % Al, 1.93 wt. % Cr, and 1.5 wt. % Mo) showed that the presence of 0.015 to 0.035% H in VT3 alloy accelerates the $\beta \rightarrow \alpha$ eutectoid reaction. Heating in 0.05 to 0.06% H disintegrates the β phase into titanium hydrate. With 0.12% H the β phase is stabilized, and the eutectoid reaction does not appear in annealing at 400 to 500°C for 100 hours. In the Mo-containing VT3-1 alloys, the residual β phase does not disintegrate after annealing for 100 hours at 400 to 500°C even in the presence of 0.0015 to 0.12 % H. The presence of hydrogen in the β phase expands considerably the parameter of the elementary cell. At 400 to 500°C the residual β phase of the alloys is enriched with chromium and molybdenum. (R.V.J.)

4745

CERMETS FROM THERMITE REACTIONS. J. D. Walton, Jr. and N. E. Poulos (Georgia Inst. of Tech., Atlanta). J. Am. Ceram. Soc. 42, 40-9(1959) Jan.

The process whereby the components of a thermite are pressed into a desired shape and ignited to form a cermet is described. In this process, the oxide of the cermet (Al_2O_3) is produced from the oxidation of powdered aluminum, and the metallic phase is produced from the resulting reduction of its oxide. A third component (clay, Al_2O_3, or MgO) is added to act as a control agent. Methods of compacting and firing are described. A table of oxides reduced by aluminum using this process is presented. The formation of metallic silicides and borides as the metallic phase of a cermet from the appropriate silicates and borates, or metallic oxides with silica or boric acid, is discussed. As an example, $ZrSi_2$ is produced by the reduction of either $ZrSiO_4$ or ZrO_2 and SiO_2, and TiB_2 by the reduction of TiO_2 and B_2O_3. The following advantages may be obtained by this method: inexpensive compositions, low ignition temperatures (1800°F), high reaction temperatures (5000°F), short firing time (1 hour), and controlled atmosphere unnecessary. A technique was developed whereby cermet test specimens could be prepared from the thermite reaction between aluminum and zirconium silicate. The tensile strength of the finished cermet is given at room temperature and at 2200°F. The apparatus used for determining these tensile strengths is described. Modulus of rupture data also are given. Other oxide thermites were added to the basic zirconium silicate thermite mixture. The effect of these thermite additions on the strength of the basic thermite is described. (auth)

4746

ALUMINIZED STEEL, PROPERTIES AND USES. K. G. Coburn (Armco Steel Corp., Middletown, Ohio). J. Metals 11, 38-9(1959) Jan.

Aluminized steel is manufactured in two grades. One has a Si–Al alloy coating and is best suited in an environment where a combination of heat and corrosion is involved. The second grade has a pure Al coating and has excellent resistance to atmospheric corrosion. The physical properties, welding, corrosion, and uses of these alloys are described. (W.L.H.)

4747

30,000 DEGREES WITH THE PLASMA JET. J. Metals 11, 40-2(1959) Jan.

The development of plasma-type torches capable of producing a jet of electrically neutral, partially ionized gas at extremely high temperatures is described. The plasma-type torch enables the fabrication of shapes and application of coatings that will withstand temperatures above 5000°F. (W.L.H.)

4748

SURFACE TENSIONS OF BINARY MIXTURES OF LEAD CHLORIDE AND ALKALI METAL CHLORIDES. June Lomnes Dahl and Frederick R. Duke (Iowa State Coll., Ames). J. Phys. Chem. 62, 1498-1501(1958) Dec.

An apparatus and technique based on maximum bubble pressure for determining fused salt surface tensions are described. The method is applied to mixtures of each of the alkali chlorides with $PbCl_2$; it is found that the heavier alkali chlorides in mixture with $PbCl_2$ form complex ions, and in one case at least, that of $CsPbCl_3$, the complex arrangement persists in the solid. (auth)

4749

WELDING AND METAL FORMING IN RUSSIA. Arthur B. Tesmen (Baldwin-Lima-Hamilton Corp., New York). Metal Progr. 75, No. 1, 79-83(1959) Jan.

Practices in welding, progress made in forging and extrusion, and the use of special metal forming techniques in Russia are discussed. (J.E.D.)

4750

NEW PLASMA TOOLS HANDLE ULTRA-HARD METALS. Peer Fossen. Missiles and Rockets 4, No. 25, 26-7(1958) Dec. 22.

Plasma torches capable of fabricating metal shapes and applying coatings that will withstand temperatures above 5000°F are described. The metal or substance to be worked is prepared in either wire or powder form and is passed through an intense arc that is struck inside the torch. The material is then carried out of the torch by inert gases flowing at high velocity and is deposited on the part being made or plated with such force that a firm bond results. (W.D.M.)

4751

THE SLIP PLANE STARTING IN THE PLASTIC DEFORMATION OF VERY PURE ALUMINUM WITH AVERAGE PARTICLE SIZE. R. J. Hartmann and E. Macherauch (Max-Planck-Institut für Metallforschung, Stuttgart). Naturwissenschaften 45, 540-1(1958). (In German)

On samples of Al, 99.99% pure, with an average particle size from 0.04 to 0.25 mm^2 the activated slip planes were determined after plastic deformation of approximately 8%, and it was established that about 40% of the observed slip planes had no (111) plane. Almost 60 slip planes were determined, and in addition to the (111) slip plane, many (100), (110), and (113) planes were observed. In each case, a (133) plane was apparently activated. (J.S.R.)

4752

URANIUM MINES CONTINUE SPECTACULAR PATTERN OF DEVELOPMENT. Precambrian 31, No. 11, 74-6, 80, 82-3, 86, 88, 91-3, 95, 97-8(1958) Nov.

The development of the uranium resources in Canada and the uranium production of the various Canadian mines are reported. The current and possible future uranium markets and the production of the industry are discussed. (J.E.D.)

4753

COMPLETELY NONMAGNETIC ALLOY FOR INSTRUMENTATION IN MAGNETIC FIELDS. Emerson W. Pugh (Carnegie Inst. of Tech., Pittsburgh). Rev. Sci. Instr. 29, 1118-19(1958) Dec.

A high-purity copper–nickel alloy is described which has zero magnetic moment at room temperature and less than a tenth the moment of pure copper at all temperatures down to 2°K. The alloy was used with considerable advantage in sample holders for magnetic force measurements, and other uses are anticipated. A method of preparing the alloy is discussed which requires limited metallurgical equipment. (auth)

4754

RAPID-QUENCHING HOT STAGE FOR METALLOGRAPHY. G. R. Speich and Morris Cohen (Massachusetts Inst. of Tech., Cambridge). Rev. Sci. Instr. 29, 1129-31(1958) Dec.

A microscope hot stage designed for use at temperatures up to 1100°C and for rapid quenching rates up to 500°C per sec is described. The stage is especially suited for the study of reactions in steels where it is often necessary to quench quickly from the austenitizing temperature to some lower transformation temperature. The sample is protected from oxidation vacuum or an inert atmosphere. (auth)

4755

SOLID STATE SPECTROSCOPY OF METALS AND ALLOYS AS A MEANS OF STUDYING THE ELECTRON STRUCTURE OF THEIR CONDUCTIVITY BAND. M. D. Borisov and A. M. Fefer (Inst. of Metal Physics, Academy of Sciences, Ukrainian SSR). Ukrain. Fiz. Zhur. 2, 122-36(1957) Apr.-May. (In Ukrainian)

The fine structure of the K_{β_5} band from the Cr, Fe, Co, Ni, and Cu of a Co–Ni–Cu alloy was studied with a large-aperture spectrograph having a crystal bending radius of 500 mm in a wide temperature region. It was shown that the basic elements of the fine structure study of the x-ray emission bands, i.e., their maximum position in wave lengths, their band shape, the x-ray band width, their intensity, the number of outer electrons per atom in the conductivity band, etc., can be obtained on investigating the middle region of the x-ray spectrum. (tr-auth)

4756

USE OF RADIOISOTOPES IN STUDYING METAL CORROSION AND PASSIVATION. I. V. Krotov. Uspekhi Khim. 27, No. 5, 643-67(1958) May. (In Russian)

The subjects of review are: mechanism of exchange between labeled ions in solution and metal surfaces; isotopic tracer studies of metal-cleaning processes; use of stable and radioactive isotopes in studying certain corrosion processes; tracer uses in corrosion inhibitor mechanism studies; tracer studies on phosphate coatings on metals; and use of autoradiography in studying the properties of metal surfaces. (tr-auth)

4757

MEASUREMENT OF THE RIGHI-LEDUC EFFECT IN SOME COPPER AND SILVER ALLOYS. Hans-Eberhard

Schmidt (Max-Planck-Inst., Stuttgart). Z. Naturforsch. 13a, 902-3(1958) Oct. (In German)

The Righi-Leduc coefficient B_{RL}, which is proportional to the temperature drop formed by the effect of a magnetic field on a conductor, was measured for Ag–Pd, Cu–Ni, and Cu–Au alloys. The experimental results were compared with the theoretical ones as a function of palladium, nickel, and gold concentrations. (J.S.R.)

4758

ANTIFERROMAGNETISM IN IRON γ PHASE. E. I. Kondorskii and V. L. Sedov (Moscow State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 35, 1579(1958) Dec. (In Russian)

The temperature dependence of austenite steel (18% Cr and 9% Ni) magnetic resistance was studied at 109 to 11.3°K. At 40°K, an explicit antiferromagnetic transition was observed. (R.V.J.)

4759

X-RAY STRUCTURE STUDIES ON CERTAIN TRANSITION METAL SYSTEMS. E. E. Cherkashin. Zhur. Neorg. Khim. 3, No. 3, 650-3(1958) Mar. (In Russian)

Experimental data are briefly presented for systems containing two or three of the metals Mn, Be, Cr, V, Mo, W, Ta, Nb, Si, Sn, Co, Ge, Ni, Zr, Cu, and Fe. New compounds in which Be and Mn figure prominently are indicated with their structure types. (tr-auth)

4760

CONTRIBUTION TO THE STUDY OF NUCLEAR FUEL MATERIALS WITH A METALLIC URANIUM BASE. Marcel Englander. Paris, Presses Universitaires de France, 1958. 81p. (In French)

The property requirements of a nuclear fuel material which contains U metal are discussed. The conditions for improving the physico-metallurgical properties of U and U alloys are outlined and discussed in detail. (T.R.H.)

4761

INFLUENCE OF HOT-WORKING CONDITIONS ON HIGH-TEMPERATURE PROPERTIES OF A HEAT-RESISTANT ALLOY. Report 1341. John F. Ewing and J. W. Freeman (Univ. of Michigan, Ann Arbor). pp. 1599-1650 in "Forty-Third Annual Report of the National Advisory Committee for Aeronautics, 1957, Administrative Report Including Technical Reports, Nos. 1269 to 1341." Washington, United States Government Printing Office, 1958. 1659p. $10.25.

The relationships between conditions of hot-working and properties at high temperatures and the influence of the hot-working on response to heat treatment were investigated for an alloy containing 20% Cr–20% Ni–20% Co–3% Mo–2% W–1% Nb. (W.L.H.)

4762

URANIUM AND THORIUM. L. Grainger. London, George Newnes Limited, 1958. 209p.

The technology of uranium and thorium from their occurrence and extraction, through their chemical and physical properties, to their uses in the atomic energy industry is described. (W.L.H.)

4763

THE ELEVATED-TEMPERATURE PROPERTIES OF WELD-DEPOSITED METAL AND WELDMENTS. ASTM Special Technical Publication No. 226. Howard R. Voorhees and James W. Freeman. Philadelphia, American Society for Testing Materials, 1958. 226p. $5.50.

Data are presented for carbon, low-alloyed and austenitic steels, and for a number of complex alloys developed for high strength at high temperatures. Tensile, rupture, and creep properties are included. The data sheets provide space for information on the welding methods and conditions, chemical composition of base metal and weld deposit, heat treatments, hardness, and microstructural characteristics. Both original test data and derived creep and rupture strengths are shown on the data sheets. Properties are reported for specimens taken entirely from weld-deposited metal as well as for cross-weld specimens which included both base metal and weld deposit in the gage section. In cross-weld specimens the weld deposit frequently differed in composition from the base metal, and in some cases two different base metals were present in the same weldment. Some data included sheet specimens welded without filler metal. (W.L.H.)

4764

KORROZIYA i ZASHCHITA METALLOV. (Corrosion and Protection of Metals.) R. S. Ambartsumyan, M. S. Lagovskaya, et al., eds. Moscow, Oborongiz, 1957. 366p.

A compilation of sixteen articles on the corrosion and protection of metals and alloys is presented. The topics discussed include corrosion and passivation of metals in various oxidizing media, corrosion of high-strength steels under tension, corrosive cracking, intergranular corrosion and pitting of aluminum alloys, anodic oxidation of aluminum alloys, corrosive cracking of magnesium alloys, and protection of magnesium alloys. (TCO-J.S.R.)

4765

BEHAVIOR OF METALS AND DESIGN REQUIREMENTS FOR ELEVATED TEMPERATURES, JUNE 17 THROUGH JUNE 27, 1958. Cambridge, Massachusetts Institute of Technology, 1958. 439p.

Equations relating elongation to the amount of shear taking place both along grain boundaries and in slip planes of polycrystalline aggregates during creep are presented. The contribution of grain-boundary sliding to total elongation in creep of pure Al was determined quantitatively as a function of temperature and solid solution alloying with Mg. A general treatment is given of creep deformation. The fracture of metals and alloys at elevated temperatures is discussed. Some aspects are presented of the utilization of creep data for engineering design purposes. A summary of the present state of stress analysis in the presence of creep is given. An analysis is presented of thermal stresses and thermal stress fatigue in metals and alloys. The importance of fatigue as a cause of service failure at elevated temperature is discussed. Correlation and extrapolation of creep and stress rupture data as a function of the time-temperature are given. Equations are given for specific creep solutions for practical problems. Multiaxial creep testing is discussed. (W.L.H.)

PARTICLE ACCELERATORS AND HIGH-VOLTAGE MACHINES

4766 AFOSR-TN-58-654

[Oxford Univ.]

AN S-BAND FERRITE ISOLATOR FOR USE WITH A LINEAR ACCELERATOR. Technical Note No. 1. [1958]. 5p. Contract AF61(514)-1183. (AD-162185).

A ferrite isolator that handles 1 megawatt of S-band

is described. Results that show the great advantage of using an isolator when operating a magnetron with a narrow bandwidth load are given. It is pointed out that the use of isolators gives designers of electron accelerators freedom to use very high Q or variable impedance devices. (auth)

4767 CERN-58-25
European Organization for Nuclear Research, Geneva.
LES LENTILLES QUADRUPOLAIRES MAGNETIQUES. (Quadrupolar Magnetic Lenses.) Pierre Grivet and Albert Septier. Oct. 15, 1958. 162p.

An investigation of quadrupolar magnetic lenses by experimental and mathematical means is described. The objects of the study were: practical realization of relatively low-power lenses for the synchrotron injection beam; precise determination of the distribution of the magnetic field; determination of the possible influence of saturation on the topography of the field in the useful zone; determination of the first-order optical properties of a two-lens system; measurement of the aberrations directly; and correction of the aberrations. Results of calculations of the aberrations by electronic computers are given. (T.R.H.)

4768 CERN-58-27
European Organization for Nuclear Research, Geneva.
H.F. POWER METER FOR OPERATION AT 2.5 MW PULSED POWER. E. Zaccheroni. Nov. 1958. 21p.

A description is given of an oil-cooled dummy load specially constructed to measure the output power of the 2.5-Mw pulse amplifier of the CERN linear accelerator. The equipment can be used both as a dummy load and as a calorimetric power meter. Arrangements have been made to use it also as an attenuator of more than 30 db. (auth)

4769 CERN-58-28
European Organization for Nuclear Research, Geneva.
SOME CONSIDERATIONS ON THE PLANNING OF EXPERIMENTAL PROGRAMS FOR THE 25 GEV PROTON SYNCHROTRON. Luke C. L. Yuan. Dec. 1958. 18p.

A brief résumé is presented on some specific aspects of the recommendations considered in regard to the minimum requirements for the initial phase of experimental set-ups at the proton synchrotron. (W.D.M.)

4770 CERN-PS/GL-9
European Organization for Nuclear Research, Geneva.
EFFECT OF TWISTS ON BETATRON OSCILLATIONS. G. Lüders. Nov. 1953. 43p.

A treatment of the effects of twists (stopbands and suppressed resonances) is given, including the interaction with other types of imperfections. (auth)

4771 CERN-PS/GL-11
European Organization for Nuclear Research, Geneva.
SUMMARY OF THE CERN-PS INJECTION PHILOSOPHY. G. Lüders. Dec. 1953. 19p.

A summary is given of the present state of thinking in general terms of injection (optimum fit, "admittance," etc.). The dependence of the admittance on the mode is shown in a curve. Further, the transfer matrix for optimum fit is written down, but no attempt is made to realize this transfer matrix by magnetic or electric fields.

4772 MURA-433
Midwestern Universities Research Assn., Madison, Wis.
LIOUVILLE'S THEOREM FOR A CONTINUOUS MEDIUM WITH CONSERVATIVE INTERACTIONS. R. L. Mills and A. M. Sessler. Oct. 8, 1958. 7p. Contract AT(11-1)-384. $1.80(ph OTS); $1.80(mf OTS).

It is shown that for a continuous medium with conservative interactions the density in six-dimensional phase space is preserved as one follows the motion of the medium. (auth)

4773 MURA-434
Midwestern Universities Research Assn., Madison, Wis.
EFFECTS OF RADIAL STRAIGHT SECTIONS ON THE BETATRON OSCILLATION FREQUENCIES IN A SPIRAL SECTOR FFAG ACCELERATOR. Phil L. Morton. Oct. 21, 1958. 38p. Contract AT(11-1)-384. $6.30(ph OTS); $3.00(mf OTS).

It is desirable to introduce radial straight sections into spiral sector accelerators in order to accommodate accelerating cavities of reasonable design and magnet windings. Such straight sections make the accelerator non-scaling, i.e., in general the betatron oscillation frequencies vary with energy and resonances may be crossed. These effects were investigated analytically in the linear approximation. The equations of motion are now functions not only of the accelerator parameters but also of the geometry of the radial straight sections and of the equilibrium orbit radius. If the number of spirals per revolution is N and the number of radial straight sections per revolution is p, then all harmonic numbers $n < \frac{1}{2} q$, where q equals p divided by the greatest common divisor of p and N, do not contribute to the change of betatron oscillation frequencies with energy. Since the contributions of a harmonic to the frequencies decrease as the harmonic number increases, it appears that the variation of betatron oscillation frequencies with energy can be kept within acceptable limits. (auth)

4774 MURA-437
Midwestern Universities Research Assn., Madison, Wis.
SCALING SPIRAL SECTOR FFAG ACCELERATORS WITHOUT MEDIAN PLANE SYMMETRY. F. T. Cole. Dec. 4, 1958. 10p. Contract AT(11-1)-384. $3.30 (ph OTS); $2.40(mf OTS).

The treatment of an earlier report (MURA-406) of particle orbits in FFAG accelerators with radial magnetic fields in the median plane is extended to include the effects of magnet spiraling. It is found that a two-way accelerator with a circumference factor lower than that for conventional fields and with reasonable focusing properties can be made in this way. Methods of producing such magnetic fields are not treated. (auth)

4775 CEA-tr-R272
SOURCE D'IONS MULTI-CHARGÉS D'AZOTE DESTINÉE À UN CYCLOTRON. (Source of Multiply-Charged Nitrogen Ions for a Cyclotron.) P. N. Morosov, B. M. Makov, and M. S. Ioffe. Translated by [H.] Bourrely from Atomnaya Energ. 2, 272-5(1957). 11p.

An ion source installation is described which produces N^{5+} ions for a cyclotron. Its design is based on ionization by electron collisions in an oscillating discharge produced in an intense longitudinal magnetic field with a high density of high-energy electrons. (T.R.H.)

4776 NP-tr-193
INVESTIGATION OF THE PROTON ENERGY SPECTRUM IN THE INTERNAL PHASOTRON BEAM. Yu. D. Prokoshin and G. N. Tentyukova. Translated for

U.K.A.K.E.A. Atomic Energy Research Establishment from Pribory i Tekh. Ekspt., No. 2, 18-22(1957). 11p.

Measurements of the energy spectrum of protons in the internal beam were carried out on the phasotron of the United Institute of Nuclear Studies. The energy of protons bombarding the internal target was chosen equal to 400, 550, and 650 Mev. In these experiments the system of filaments was placed at various distances from the center of the accelerator. The activities of the irradiated filaments were measured in a standard geometry with the aid of a group of proportional counters. (W.D.M.)

4777

CONCEPTUAL ADVANCES IN ACCELERATORS. David L. Judd (Univ. of California, Berkeley). Ann. Rev. Nuclear Sci. 8, 181-216(1958).

A review of the key ideas which are making possible the present developments in accelerators is presented. The general period covered is from March 1954 to June 1958, although some mention is made of earlier work. Topics discussed include conceptual advances in high-energy accelerators, phase-space concepts applied to accelerator problems, proposals, and recent progress in construction. (W.D.M.)

4778

SUPPRESSION OF BETATRON OSCILLATIONS IN STRONG-FOCUSING ELECTRON SYNCHROTRONS. A. A. Kolomenskii and A. N. Lebedev. Atomnaya Energ. 5, 554-7(1958). (In Russian)

Various methods are studied for a simultaneous radiation damping of synchrotron and betatron oscillations in a strong-focusing accelerator. Formulas are developed for calculations of damping decrements. It was noted that the orbital curvature in damping magnets differs from the basic sector curvature. It is shown that the sum of damping decrements is the same for all cases of damping. (tr-auth)

4779

HIGH-CURRENT, 400-kv COCKCROFT-WALTON ACCELERATOR. W. L. Bronner, K. W. Ehlers, W. W. Eukel, H. S. Gordon, R. C. Marker, and F. Voelker (Applied Radiation Corp., Walnut Creek, Calif.) and R. W. Fink (Univ. of Arkansas, Fayetteville). Nucleonics 17, No. 1, 94-7(1959) Jan.

A 400-kv Cockcroft-Walton accelerator capable of delivering 2-ma ion beams with hydrogen isotopes is described. Target techniques have provided neutron yields of 10^{11} to 10^{12} DT neutrons/sec (14.8 Mev at 0° to the beam axis) and 7×10^{8} DD neutrons/sec (2.95 Mev at 0°). (J.H.M.)

4780

He^3 RECIRCULATION AND PURIFICATION SYSTEM FOR A CYCLOTRON ION SOURCE. H. E. Wegner and W. S. Hall (Los Alamos Scientific Lab., N. Mex.). Rev. Sci. Instr. 29, 1100-3(1958) Dec.

A He^3 circulation system for a cyclotron was built which will recover the gas and purify it continuously. This is accomplished by modifying a mechanical vacuum pump to meet the following special requirements: intake and exhaust sealed for both pressure and vacuum; small volume on the exhaust side; minimum oil volume. This pump, which is used instead of the cyclotron forevac pump during He^3 operation, recovers the gas and forces it through a liquid nitrogen-cooled charcoal trap and on to the ion source. The system is completely interlocked to ensure He^3 safety in the event of operator or electrical failure. With a flow rate of 6 cc per minute, the normal He^3 loss over a period of 200 hours operation was less than 3 cc per hour after an initial charge of 1000 cc NTP. With trap reactivation periods of 50 hours, no change in ion yield was observed. External beams of approximately 100 μa of doubly charged particles were obtained. (auth)

4781

APPLICATION OF POWER RECOVERY TO LINEAR ACCELERATORS. L. O. Dushin and M. A. Khizhmyak (Inst. of Physics and Tech., Academy of Sciences, Ukrainian SSR). Ukrain. Fiz. Zhur. 2, 106-13(1957) Apr.-May. (In Ukrainian)

The expedience of h-f power recovery in short linear accelerators is given a theoretical basis and is checked experimentally. Recovery has the following advantages: increase of particle energy at the accelerator output without raising the feeding generator power; increase of the beam current without energy change; increase of accelerator stability at full beam loading, thus raising the limiting current of accelerated particles without increasing the generator power. Theoretical conclusions were checked at low and high power levels, employing a ring waveguide bridge and a small (0.7 Mev) electron linear accelerator. (tr-auth)

4782

ON CYCLIC ACCELERATION OF PARTICLES IN HIGH FREQUENCY FIELDS. V. I. Veksler and L. M. Kovrizhnykh (Lebedev Inst. of Physics, Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 35, 1116-18(1958) Nov. (In Russian)

The feasibility of employing high-frequency fields for controlling the motion of particles in cyclic accelerators is demonstrated. (tr-auth)

PHYSICS AND MATHEMATICS

General

4783 AD-157596

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. INVESTIGATION OF CADMIUM SULFIDE AS A DETECTOR FOR MEASURING GAMMA BUILD UP IN AN INFINITE GEOMETRY (thesis). George Ralph Crane. Mar. 1958. 53p.

The small size and remote-reading capability of a photoconductive crystal, whose output current was proportional to the exposure dose rate, seemed to qualify it for further investigation as a build-up detector. Highly-doped cadmium-sulfide crystals were found to give linear conductivity response with dose rate from Co^{60} gammas. Their gamma-sensitivity and rise by time characteristics were measured under variable temperatures, potential gradients, and dose rates. The optimum operational conditions were defined for using the crystal as a build-up detector. Crystal output current was read by using a micro-ammeter in a simple d-c circuit. Build-up values were determined for lead, iron, and aluminum for several irradiation configurations in spherical geometry. These values compared favorably with computed theoretical values, thus attesting the value of the detector. Some ratios of $B_{infinite}/B_{finite}$ were also reported. Further detector refinements are pointed out, in addition to suggestions for its use in studying build-up. (auth)

4784 AERE-X/M-181

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England and Manchester. Univ., England. Physical Labs.

THE PASSAGE OF HEAVY IONS THROUGH MATTER. A Bibliography. July 1958. 25p.

This bibliography includes range-energy relations, charge exchange, and related phenomena for particles of charge 3 and above. Both experimental and theoretical papers are included for the years 1913 to 1958. The subject of hydrogen and helium ions is extensively reviewed. (A.C.)

4785 AERE-X/PR-2115

British Thomson-Houston Co., Ltd., Rugby, England.

A THEORETICAL SURVEY OF THE ELECTRO-MAGNETIC PUMP FOR LIQUID METALS. L. R. Blake. Feb. 1951. Decl. Jan. 13, 1959. 103p. (L-4002-C).

The theory of the four main types of electromagnetic pumps for liquid metals, d-c conduction, a-c conduction, a-c induction, and travelling-field induction types, is reviewed. The four types are then analyzed to determine the factors which control performance, i.e., pump pressure, flow, and pump efficiency. The travelling-field type seems the most promising, and means are suggested for reducing the main source of loss, the end effects due to an unwanted pulsating component of flux in the core with normal windings. The design data are presented for a straight-through annular-type pump with a graded winding. (L.M.T.)

4786 AFCRC-TN-57-780

Illinois. Univ., Urbana. Engineering Experiment Station.

ELECTRON INTERACTIONS IN GASEOUS DISCHARGE PLASMAS AND THEIR EFFECT ON CYCLOTRON RESONANCE. Scientific Report No. 3. Rudolph C. Hwa and L. Goldstein. Sept. 30, 1957. 158p. Project No. 4156. Contract AF19(604)-2152. (AD-133729).

Electron-electron interactions in gaseous discharge plasmas are studied. They are found to have an effect on the electrical conductivity of the plasma when it is under cyclotron resonance conditions. The magnetic properties of the plasma at cyclotron resonance are investigated. The effect of the electron-electron interactions on the velocity distribution function of the electrons is studied. The fluctuating motions of the electrons due to the short-range Coulomb forces are considered by treating the electrons as Brownian particles. (W.D.M.)

4787 AFCRC-TN-58-457

Air Force Cambridge Research Center. Geophysics Research Directorate, Mass.

A BIBLIOGRAPHY OF THE ELECTRICALLY EXPLODED WIRE PHENOMENON. GRD Research Notes No. 2. William G. Chace. Nov. 1958. 74p. (AD-152640).

Original abstracts and abstracts taken from Physics Abstracts, Transactions of IRE, Chemical Abstracts, etc., are compiled. The arrangement is by subject group, alphabetical by authors, and inverse chronological for articles by any one author. (auth)

4788 AFOSR-TN-58-952

Maryland. Univ., College Park.

ARTIFICIAL MODIFICATION OF THE EARTH'S RADIATION BELT. Fred Singer. [1958]. 31p. Contract AF18(600)-1038. (AD-205345).

Presented at the Fifth Annual Meeting of the American Astronautical Society, Washington, D. C., December 27-31, 1958.

The length of time for which particles stay trapped in the radiation belt may be calculated, and suggestions as to their origin may be made. To get greater precision in theoretical predictions, it is essential to do experiments. One of the most interesting experiments which suggests itself is that of injecting artificially accelerated particles directly into the radiation belt region. One promising method would consist of carrying a small electron accelerator aloft in either a satellite or even a high-altitude rocket. The most direct place for conducting the experiment is near the equator at an altitude of from 600 to 1000 miles. The particles which are injected, preferably electrons of the order of 2 Mev, would rapidly diffuse in a type of "napkin ring" region around the earth. This diffusion only requires a few seconds since the particles move with nearly the speed of light. Electrons then stay trapped in this napkin ring region, diffusing out of it very slowly. The primary reason for their outward diffusion may be collisions with the very rarefied atmosphere which is still present even at these high altitudes. Therefore, by studying the number of remaining electrons from day to day, the density of the atmosphere in a region of space where densities can normally not be measured may be studied. The simplest way to determine this density is by firing sounding rockets daily through this napkin ring region and determining the electron intensity profile from day to day and see how it decays. Such a region can be expected to last for a few days to a few weeks, depending on the altitude and depending on what actual air densities exist at these altitudes. The injection apparatus would only weigh of the order of 500 pounds including its power supply and could provide a very substantial increase in the radiation belt intensity in a small region. The reason for this striking increase with such small equipment is again due to the fact that the earth's magnetic field has such good trapping properties. The sounding rockets which are sent up after the injection to check up on the fate of the electrons can be quite simple and need only carry Geiger counters with associated circuits weighing on the order of a pound or less. A project of this type is therefore feasible immediately. (auth)

4789 AI-3051

Atomics International Div., [North American Aviation, Inc.], Canoga Park, Calif.

RESEARCH ON ELECTRON ENERGY STATES IN TRANSITION METALS. Final Report for Period May 1, 1957—June 30, 1958. Ted G. Berlincourt, Guy W. Lehman, and R. R. Hake. 43p. Contract AF18(600)-1575. (AFOSR-TR-58-109; AD-201611).

Measurements were carried out on the Hall effect, resistivity, and magnetoresistivity of Cu, Zr, Ti, and Nb at temperatures between ~1°K and room temperature and in magnetic fields up to 30 kilogauss. A method for computing the energy levels in alloy systems using the augmented plane wave approach of Slater was worked out. (W.D.M.)

4790 APAE-Memo-161

Alco Products, Inc., Schenectady, N. Y.

THERMAL ANALYSIS ON THE IBM 650. LOVELY—I, PROGRAM NO. 55. J. D. Love and C. J. Stuack. Nov. 26, 1958. 27p. Contract AT(30-3)-326. $4.80 (ph OTS); $2.70(mf OTS).

A program is given for the establishment of flow requirements of a tailored flow core. It is capable of

handling either one- or two-pass cores, with flow direction optional in each pass, and a reflector coolant flow in parallel with either pass. The various configurations which may be investigated are illustrated. Although the program is specifically intended for APPR-type elements, flows may be established for any set of dimensions and pressure and temperature conditions and corresponding to any desired maximum allowable surface temperature. It is expected that, due to pressure drop considerations, for two-pass flow all control rods will be in the same pass. Calculated results include flow requirements of each individual type of element, as well as total internal flow, lattice flow, and finally the total required flow for each pass. Calculation of the maximum ratio of operating to burnout heat flux and maximum internal temperature is optional. (auth)

4791 APEX-374

General Electric Co. Aircraft Nuclear Propulsion Dept., Cincinnati.

MONTE CARLO RESEARCH SERIES: BASIC THREE-DIMENSIONAL MONTE CARLO PROGRAM FOR CYLINDRICAL GEOMETRY. PART I. PHYSICS AND METHOD. J. R. Beeler, Jr., and J. W. Ryan. Jan. 1958. 60p. $9.30(ph OTS); $3.60(mf OTS). (XDC-58-3-149).

A Monte Carlo program for the IBM 704 is described. It is intended to be primarily useful in the computation of intensive reactor parameters. The program is suited to cylindrical geometry wherein parallel tubular regions are arbitrarily located in a matrix of concentric circular annular regions. Normally the annular regions correspond to moderator and/or reflector regions and the interjected tubular regions to fuel elements. The program requires a 32,768 word core memory and four tape units. Package PK-1 from the library of General Electric packages is also required. (auth)

4792 APEX-433

General Electric Co. Aircraft Nuclear Propulsion Dept., Cincinnati.

SHIELDING COMPUTER PROGRAM 11-0, REACTOR SHIELD ANALYSIS. K. B. Hanchon. Nov. 1958. 9p. Contracts AF33(600)-38062 and AT(11-1)-171. $0.50 (OTS).

Shielding Program 11-0 uses the Albert-Welton point kernel to compute the fast neutron dose rates in an infinite hydrogenous medium from a point isotropic fission source. Instructions for making out input data are included, and a sample case is given for illustration. (auth)

4793 CF-58-12-79

Oak Ridge National Lab., Tenn.

THE NEED FOR U^{233} BREEDING. W. K. Ergen, E. D. Arnold, E. Guth, S. Jaye, A. Sauer, and J. W. Ullmann. Dec. 15, 1958. 14p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

If the fissionable and fertile materials recoverable at approximately today's cost are to constitute an energy reserve at least as large as fossil-fuel energy reserves, about 20% of the fertile material has to be burned. This means reactors need a conversion ratio of about 96% on the average. Some reactors will of necessity be burners; hence the 96% average can only be obtained if other reactors are breeders. Comparison of nuclear-fission energy reserves with anticipated power demands indicates that breeding will not be necessary until 1980. Whether it will become a necessity between 1980 and 2000 depends on which of a number of reasonable estimates are chosen. In order to keep up with the demand, breeders must have a doubling time equal to or shorter than the doubling time of the demand for nuclear power production. The latter doubling time is estimated to be 5 to 10 years. Such short doubling times will probably be achieved more easily with U^{233} breeders than with plutonium breeders. Thorium, the raw material for the U^{233} breeder, is available in sufficient quantity in economically recoverable deposits on the North American continent, but the raw material for plutonium breeders (U^{238}) is available in larger amounts. Among U^{233} breeders the aqueous homogeneous reactor with its highly thermal neutron spectrum and consequently high η, its high specific power, easy fission-product removal, and short reprocessing time will probably reach the shortest doubling times. (auth)

4794 ER-10485

Martin Co., Baltimore.

ENERGY AND ANGULAR DISTRIBUTION OF GAMMA RAYS, BREMSSTRAHLUNG AND ANNIHILATION RADIATION IN A LEAD CYLINDER. R. I. Hildebrand and W. C. Outten. Nov. 1958. 83p.

A Monte Carlo Program for the IBM 704 was developed for calculating the energy spectrum of gamma rays reaching a detector at any point inside a finite open-ended cylindrical shield. The shield may comprise up to ten coaxial regions representing different materials. The energy spectrum and angular distribution of the gamma rays incident upon the outside of the cylinder are assumed to be known. In the mathematical model, the following phenomena are considered: Compton scattering and the bremsstrahlung associated with the Compton electron, photoelectric absorption and the associated bremsstrahlung, and pair production including the associated annihilation radiation and bremsstrahlung. The Klein-Nishina equation is simulated by a fourth-degree polynomial for each energy group up to a maximum of 58. Results were obtained from twenty-four 500-history calculations. Data were obtained for 1, 5, and 10 Mev gamma rays incident on the outside surface of a 6.35-cm thick lead cylinder. Data were obtained for all three energies at angles of 0, 30, and 60° relative to the surface normal. Angles were measured in the plane of the cylindrical axis and the surface normal. Nine calculations were made for gamma rays, bremsstrahlung, and annihilation radiations followed for the entire shield, and repeated for gamma rays only. Data showing the energy distribution and angular distribution are plotted for gamma rays only and gamma rays plus bremsstrahlung and annihilation radiation. A calculation was made at 5 and 10 Mev for gamma rays and annihilation radiation followed through the entire shield, and bremsstrahlung followed through the last 1, 2, and 3 millimeters of shielding. The data indicate that bremsstrahlung may be neglected at 1 Mev. At 5 and 10 Mev the presence of bremsstrahlung and annihilation radiation are significant if a large quantity of 5- or 10-Mev gamma rays are incident on the surface of the shield. (auth)

4795 GA-126

General Atomic Div., General Dynamics Corp., San Diego, Calif.

ADAPTION OF THE S_n METHOD TO CELL CALCULATIONS. Egil Bjørnerud and L. W. Nordheim. May 22, 1957. 9p.

Presented at the meeting of the American Nuclear Society, Pittsburgh, June 10, 1957.

The S_n method of Carlson for numerically solving the Boltzmann equation uses zero incoming flux at the outer boundary as a boundary condition; thus it cannot be used for lattice cell calculations without modification. A boundary value iteration makes the S_n method convenient and accurate for cell calculations. (T.R.H.)

4796 GA-377

General Atomic Div., General Dynamics Corp., San Diego, Calif.

TABLES FOR THE COMPUTATION OF RESONANCE INTEGRALS. F. T. Adler and L. W. Nordheim. June 2, 1958. 72p. Project No. 1.

This report contains an extension and more detailed description of the tables in GA-350 (A/CONF.15/P/1988).

A set of tables from which effective resonance integrals can be computed from individual resonance data is presented. The basic formulas and examples of applications are given. The theory is applicable to homogeneous and heterogeneous reactors. For the latter case resonance capture and escape can be evaluated directly for open arrangements. (W.D.M.)

4797 HW-56646

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

LATTICE CALCULATIONS BASED ON EXPONENTIAL PILE RESULTS. C. R. Richey. Sept. 8, 1958. Decl. Nov. 5, 1958. 28p. Contract [W-31-109-Eng-52]. $6.30(ph OTS); $3.00(mf OTS).

Results obtained from the exponential pile experiments at Hanford have been correlated with theoretical methods for calculating lattice parameters. An effective resonance integral was obtained from this correlation which allows one to compute resonance escape probabilities with a good degree of accuracy. Comparisons are made of calculated lattice parameters and those determined experimentally. (auth)

4798 HW-56919

General Electric Co. Hanford Atomic Products Operation, Richland, Wash.

NUCLEAR PHYSICS RESEARCH QUARTERLY REPORT [FOR] APRIL, MAY, AND JUNE 1958. July 21, 1958. 76p. Contract W-31-109-Eng-52. $2.25(OTS).

The constants are calculated for the analytical solution for the thermal neutron flux in a nonabsorbing heavy gas with a temperature discontinuity, and an alternative method of deriving the group constants for Selengut's two-thermal-group approximations is given. Calculations are shown for thermal flux in a cell with temperature discontinuities by a method employing the formalism of few-group theory but retaining the qualitative features of neutron distribution. Results of buckling measurements for fuel elements in random vs. uniform array are summarized. Measurements of the number of fuel rods required for criticality for several lattices with 1.6% enriched U and light water moderator and reflector were completed using the "Approach-to-Criticality" method. In connection with processing of fuels enriched to 3%, K_∞ values were measured in PCTR for UO_2 hydrogen-moderated systems. A reevaluation of η which results in more realistic critical parameters for natural U–light water lattices is reported. A summary is given of the empirical method used to estimate critical masses of oralloy vs. core density when surrounded by a full density natural U reflector. The techniques for measurement of K_∞ in PCTR are extended to the case where there is a temperature change in the fuel. Measurement of the metal temperature coefficient of K_∞ for 19-rod clusters of UO_2 in the PCTR is described. Expressions are given for the harmonic and end corrections for a three-region exponential pile. Measurement of material bucklings of seven-rod clusters of 0.925-in.-diam. natural U fuel elements in a graphite moderator was completed. Fission cross sections for Am^{241} and Np^{237} at 0.1 to 5 ev were measured using the crystal spectrometer. The weights of the U^{235} fission foils used at Hanford and Harwell for absolute fission cross section measurements are compared. Results of measurements of the age to In resonance of monoenergetic neutrons in kerosene and water are given. (For preceding period see HW-55879.) (T.R.H.)

4799 ISC-1048

Ames Lab., Ames, Iowa.

SEMI-ANNUAL SUMMARY RESEARCH REPORT IN PHYSICS FOR JANUARY THROUGH JUNE 1958. Sept. 15, 1958. 49p. Contract W-7405-eng-82. $1.50 (OTS).

Several corrections to the theoretical beta spectrum of P^{32} decay were investigated. The magnetic properties of dysprosium are discussed. A 180° permanent magnet spectrometer was used to determine the transition energies in Yb^{169} and Tm^{170}. In the activity observed after irradiation of Tb by 64-Mev bremsstrahlung, 18 transitions were detected, with energies between 89 and 2060 kev. The mean life of positrons in pure yttrium metal was measured to be $\sim 2.0 \times 10^{-10}$ sec and in Na_xWO_3 (X = 0.789), $\sim 2.6 \times 10^{-10}$ sec. The photoproton yield from Be^9 was measured by observing the beta activity of the daughter nucleus, Li^8. Nuclear spectroscopic studies of Ba^{133} and Xe^{133} decay are reported. The thermal diffusivity and electrical resistivity of Johnson-Matthey copper were measured in the 50 to 1000°C temperature range. The infrared transmission spectra of magnesium silicide were studied at temperatures from 85 to 370°K. Measurements were made of the thermoelectric power of Mg_2Si from 300 to 1000°K. Work on the measurement of Hall mobility in semiconductors at microwave frequencies is reported. The electrical resistivity of Na_xWO_3 as a function of sodium concentration is discussed. Latent heats of sublimation were determined for several of the rare earths. The electric conductivity of diamond as a function of temperature was investigated. The superconducting transition temperature for gadolinium–lanthanum alloys was determined. The magnetic properties of Gd_3C and Tb_3C were investigated. A preliminary study of the dependence upon external pressure of the Br^{79} and Br^{81} nuclear quadrupole resonances in $TiBr_4$ found these to possess a negative pressure coefficient in the temperature range −20 to −30°C. A theoretical investigation of the effect of electron-coupled nuclear spin-spin interactions on the nuclear quadrupole resonance spectrum of Cl^{35} in $TlCl_3$ and $HgCl_2$ was performed. Abstracts of papers submitted for publication are included. (For preceding period see ISC-975.) (W.D.M.)

4800 NAA-SR-2123

Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.

TABLES OF THE CLEBSCH-GORDAN COEFFICIENTS. E. Richard Cohen. July 15, 1958. 37p. $1.25(OTS).

The Clebsch-Gordan series is derived, and summation formulas involving the coefficients are analyzed. The tables of the coefficients are given in fractional form

for elementary calculations and for an understanding of the structure of the coefficients. (W.D.M.)

4801 NAA-SR-2557

Atomics International Div., North American Aviation, Inc., Canoga Park, Calif.

THE CALCULATION OF GAMMA-RAY HEATING IN TARGET SAMPLES LOCATED IN THE BSR SHIELD. D. S. Duncan. Nov. 1, 1958. 36p. Contract AT-11-1-GEN-8. $1.00(OTS).

An analysis was made of gamma-ray heating in lead, iron, and aluminum samples as a function of position in the water shield surrounding the BSR core. The results obtained are in excellent agreement with experimental measurements. The average values of the calculated gamma-ray heat generation rates in the target materials were found to agree with the measured values, over the range of distances from the core for which the measurements were made, to within 4%, with a maximum deviation of 20%. The analysis includes the evaluation of the heat generation rates in the samples from core gamma rays, shield capture gamma rays, target capture gamma rays, and target decay beta particles. The methods of evaluation and the assumptions necessary are discussed. It is concluded that the basic gamma-ray data and calculational methods employed may be used in similar analyses for other reactor systems. (auth)

4802 NARF-58-53T

Convair, Fort Worth, Tex.

THE TWO-REGION NEUTRON TRANSPORT EQUATION. T. W. Summers. Dec. 29, 1958. 24p. Project 6(1-9964), Contract AF33(600)-32054. (MR-N-220).

The two-region neutron transport equation with plane symmetry was solved by the Wiener-Hopf method for the case in which one region contains a plane isotropic source parallel to the interface. The results are subject to the restrictions of isotropic scattering without loss of energy and a constant total mean free path. Analytical results are presented for the total flux and the angular flux at the interface. Numerical results for the total flux at the interface are presented in the form of a parameter study. (auth)

4803 NP-7120

Brussels. Centre d'Étude de l'Énergie Nucléaire.

CHOIX DU MATERIAU DES ECHANGEURS, DU MATERIAU ET DES DIMENSIONS DES CONDUITES DU CIRCUIT PRIMAIRE DE L'ETR. (Choice of the Material of Exchangers and of the Material and Dimensions of the Pipes of the Primary Circuit in the ETR.) F. Leonard and J. Goens. Dec. 10, 1957. 17p.

The choice of materials for the exchangers and the materials and dimensions of the primary coolant circuit of the Engineering Test Reactor are discussed. Some disagreements with economic aspects are mentioned. (T.R.H.)

4804 NP-7127

Brussels. Centre d'Étude de l'Énergie Nucléaire.

LE TEMPS DE VIE DES NEUTRONS DANS BR-1. (The Neutron Age in the BR-1.) J. Pillon and J. P. Lagnaux. July 28, 1958. 23p.

Neutron lifetime in Belgian Reactor-1 is calculated taking into account the effect of the reflector. An importance function must be introduced as a measure of the actual role of a neutron in a chain reaction according to its situation (energy and position) in the reactor. It is the adjoint function ϕ^{+}_{ν} at flux ϕ which fills this role. A preliminary evaluation is made based on 2-group theory. The values 1.363×10^{-3} sec, 1.099×10^{-4} sec, and 1.473×10^{-3} sec were obtained for thermal neutrons, fast neutrons, and the sum of the two. This sum value is 7.8% greater than the lifetime value for the core. (T.R.H.)

4805 NP-7161

Brussels. Centre d'Étude de l'Énergie Nucléaire.

CORRECTION DE DURCISSEMENT POUR LES EXPERIENCES DE TRANSMISSION. (Correction of Hardening for Transmission Experiments.) M. Neve de Mevergnies. Oct. 29, 1957. 13p.

Because of preferential absorption of slow neutrons, the neutron spectrum transmitted by a material placed in a neutron beam is "hardened." This effect necessitates the application of a correction to data from neutron detectors whose efficiency varies with energy. A simple analytical expression is given for this correction where the incident spectrum has Maxwellian distribution and the absorption cross section of detector and sample is the reciprocal of neutron velocity. (T.R.H.)

4806 NP-7159

Brussels. Centre d'Études Pour Les Applications de l'Énergie Nucléaire.

POSSIBILITES DE PRODUCTION DE COBALT DANS BRI. (Possibilities of Cobalt Production in the BR-1.) J. Juliens. Jan. 16, 1958. 8p.

Calculations for two different loadings of cobalt in BR-1 reactor are given. With 3.8 kg of Co uniformly arranged in the channels a maximum specific activity of 2.8 curies/g, an average specific activity of 0.67 curies/g, and a production of 2.8 curies/year were calculated. For 1.7 kg of Co in 4 or 5 central channels the corresponding values calculated were 2.8, 1, and 1.8. The smallest dimension of the pieces of Co must be less than 0.5 cm. The reactor was assumed to function at 4.5 Mw for 300 to 365 days with an available excess reactivity of 0.3%. These calculations are easily applied to other cases. (T.R.H.)

4807 NP-7166

Brussels. Centre d'Étude de l'Énergie Nucléaire.

ACTIVITES INITIALES DES COMPOSANTES D'UN MELANGE RADIOACTIF. (Initial Activities of the Components of a Radioactive Mixture.) J. Pillon. May 23, 1958. 16p.

A computer program is presented for determining the initial activity of each constituent in a mixture of known radioactive material for all physically possible activities and number of components. The problem is solved by the method of least squares, and the oranization and programming are given. (J.S.R.)

4808 NP-7170

Westinghouse Electric Corp. Research Labs., East Pittsburgh, Penna.

DISSOCIATION AND IONIZATION OF H_2^+ BY FAST PROTONS. Research Report 60-94439-1-R2. E. Gerjuoy. Sept. 22, 1955. 20p.

The cross sections for the reactions $H^+ + H_2^+ \rightarrow H^+ + H^+ + H$ and $H^+ + H_2^+ \rightarrow H^+ + H^+ + H^+ + e^-$ were estimated for incident protons of energy $E \sim 100$ kev in the laboratory system. (L.T.W.)

4809 NP-7171

Convair, San Diego, Calif.

ON THE PROBLEM OF HELMHOLTZ INSTABILITY. Robert Karplus and Kenneth M. Watson. June 15, 1958. 24p.

Several studies are made of the stability of inviscid gas flow tangential to a surface of discontinuity. In particular, the stability of flow over the surface of an

elastic solid is studied. It is concluded that the flow is stable when the flow speed v satisfies the relation $v\,(\rho_{gas})/(\rho_{solid}) < s$, where s is the sound speed in the medium and ρ is the density of the gas or solid. If the shape of the solid surface is "rippled" however, thermal etching of the surface may be enhanced. (auth)

4810 NP-7185

Michigan Univ., Ann Arbor.

PHOTOGRAPHY OF COSMIC RAY TRACKS WITH A CASCADE LUMINESCENT CHAMBER. Technical Report No. 1. Lawrence W. Jones and Martin L. Perl. Dec. 24, 1958. 24p. Contracts Nonr-1224(23)-NR-022-274 and DA-36-039-SC-52654.

The tracks of minimum ionizing particles were photographed in a luminescent chamber for what is believed to be the first time. A cascade luminescent chamber made up of three image tubes coupled with refractive optics were used to photograph tracks of cosmic ray μ mesons in a sodium iodide crystal. The apparatus is described, together with details of measurements on image tube characteristics and the nature of background. The same type of apparatus is applicable to other problems where very weak light signals (several thousand photons total) must be photographed. (auth)

4811 NRL-5225

Naval Research Lab., Washington, D. C.

HEAT-TRANSFER STUDIES ON A FORCED CONVECTION LOOP WITH MONOISOPROPYLBIPHENYL. J. P. Stone, C. T. Ewing, C. H. Blachly, E. W. Steinkuller, and R. R. Miller. Sept. 25, 1958. 18p. Project NS 200-021. Contract AT(45-1)-1070. $3.30(ph OTS); $2.40(mf OTS).

Heat-transfer coefficients for monoisopropylbiphenyl, heated in a long horizontal tube under conditions of turbulent flow, are correlated to an average deviation of ±0.99 percent with an equation of the Dittus-Boelter type. Physical properties used in correlation work are presented. The coefficients extended from 463 to 3107 Btu/hr-ft^2-°F for the following ranges of conditions: bulk-fluid temperatures, 240 to 604°F; heat-transfer surface temperatures, 312 to 816°F; heat fluxes, 44,800 to 308,000 Btu/hr-ft^2; Reynolds numbers, 18,500 to 350,000; fluid velocities, 5.7 to 36.4 ft/sec. In fouling experiments, no scaling of the heat-transfer surface of an organic type was observed at the extreme attainable conditions of 850°F heat-transfer surface temperature and 5 ft/sec fluid velocity. The condition of the equipment after 2½ years of service is discussed. (auth)

4812 NYO-6486 MH-VI

New York Univ., New York. Atomic Energy Commission Computing and Applied Mathematics Center.

FLUID MAGNETIC EQUATIONS—GENERAL PROPERTIES. Magneto-Hydrodynamics Note No. VI. A. A. Blank and Harold Grad. July 1, 1958. 26p. Contract AT(30-1)-1480. $4.80(ph OTS); $2.70(mf OTS).

Some general properties of the equations of fluid magnetics are described. A set of standard nondissipative fluid equations coupled with Maxwell's equations by a Lorentz force term and some form of Ohm's law is adopted. Within this frame there is a considerable amount of flexibility, e.g., in the choice of an equation of state and of a form of Ohm's law and in the decision to include or omit displacement current, electrostatic forces, and electromagnetic momentum. An important criterion in making these decisions is the mathematical tractability of the resultant equations. (W.D.M.)

4813 NYO-7996

Princeton Univ., N. J. Project Matterhorn.

A PROPOSED METHOD FOR THE ANALYSIS OF THE STABILITY OF HIGHLY SYMMETRIC HYDROMAGNETIC EQUILIBRIA VIA THE BOLTZMANN EQUATION. Technical Memo 57. Ira B. Bernstein. Nov. 20, 1957. 38p. Contract AT(30-1)-1238. $6.30 (ph OTS); $3.00(mf OTS).

A method is presented which in principle permits the investigation of the stability of hydromagnetic equilibria via the Boltzmann equation in the limit of negligible collisions. It is applicable only to certain highly symmetric situations, namely slab and cylinder symmetry, but where applicable it does not require any assumptions of quasi-neutrality, adiabaticity, etc. which are common to the familiar hydromagnetic treatments of the problem. The technique is an extension to the problem of small motions about an equilibrium configuration of a method for the determination of self-consistent equilibria. It consists in employing as coördinates in the Boltzmann equation quantities which are constants of the motion in the equilibrium. (auth)

4814 NYO-8145

Princeton Univ., N. J. Palmer Physical Lab.

DIRAC'S COSMOLOGY AND THE DATING OF METEORITES. R. H. Dicke. Nov. 6, 1958. 4p. Contract [AT(30-1)-937]. $1.80(ph OTS); $1.80(mf OTS).

It was suggested by Dirac that the gravitational constant was not true and that it varied inversely with the age of the universe. In addition, an argument based on Mach's Principle was used to support the idea of varying gravitational value and by implication the beta decay constant. The argument based on Dirac's hypothesis allows a calculation of the rate of change of the beta coupling constant with time. The ages determined by alpha decay should be different from those determined by beta decay, since there was a new estimate of the age of the universe based on the Hubble constant. The new age is used to calculate the correspondence between alpha and beta ages to determine if the available data on the meteorite ages can be used to exclude the hypothesis of a time-varying weak interaction constant. It was concluded that there is no present evidence sufficiently reliable to rule out a time variation in beta decay. (J.R.D.)

4815 P-1107(RAND)

RAND Corp., Santa Monica, Calif.

THE GRAPHICAL INTEGRATION OF THE ONE-PARAMETER MODEL WITH TERRAIN EFFECTS. Joseph B. Knox. June 25, 1957. 35p.

For presentation at the Conference on the Upper Air of the American Meteorological Society, Omaha, Nebraska, Oct. 8-10, 1957.

The theory of the one-parameter model is developed such that the dynamic equation at the p-level, the level of non-divergence over flat terrain, includes the effects of terrain and is of a form readily integrated by graphical procedures. A graphical procedure is devised for time integrating the one-parameter model with a "quasi-nondivergent" wind field, with terrain effects included. By means of this model, the possibility exists of quantitatively forecasting the retardation or stagnation of major trough systems approaching the North American mountain barrier, and the acceleration of major trough systems moving away from the intermountain region. (auth)

4816 P-1108(RAND)
RAND Corp., Santa Monica, Calif.
A PHYSICAL BASIS FOR FORECASTING THE PRESSURE AND HORIZONTAL WIND FIELDS IN THE LOWER STRATOSPHERE. Joseph B. Knox. Aug. 29, 1957. 14p.

The theory of the one-parameter model with flat terrain is outlined. The physical basis of the direct method of predicting the horizontal wind field is discussed briefly. (L.T.W.)

4817 PR-P-39
Atomic Energy of Canada Ltd. Chalk River Project, Chalk River, Ont.
PHYSICS DIVISION PROGRESS REPORT [FOR] JULY 1, 1958 TO SEPTEMBER 30, 1958. 87p. (AECL-716). $2.00(AECL).

Time-reversal invariance in beta decay of the free neutron was demonstrated using neutrons from the NRX Reactor. The new high-precision $\pi\sqrt{2}$ beta spectrometer was subjected to a variety of tests. This spectrometer was used in a detailed study of the Np^{239} conversion-electron spectrum. Some 127 conversion lines were observed, including 41 not previously reported. Seven K-LL Auger electron lines from Pu^{239} were observed. A series of measurements and tests was carried out at Burlington, Mass., with the Chalk River tandem accelerator. In general, the machine operated very steadily at all proton energies from 3 to 10.5 Mev. Beams of oxygen ions were obtained from the tandem machine by using oxygen instead of hydrogen in the negative ion source. A program of study of O^{16} excited states was carried out using He^3 with the 3-Mev Van De Graaff accelerator. A careful study of the levels in F^{18} was accomplished by means of the $N^{14}(\alpha,\gamma)F^{18}$ and $O^{16}(He^3,p\gamma)F^{18}$ reactions. A search in cosmic radiation for a new meson of 500 m_e has shown that at sea level the number present is less than 10^{-3} times the number of μ mesons in the same range. Calculations of the radial distribution of resonant absorption of neutrons in a natural uranium rod of the type used for fuel in NRX were carried out. Calculations on the radiation hazards in uranium mines have shown that the radon activity, which is readily measured, is probably the best measure of the airborne radiation hazard. Expressions for the lattice vibrational frequencies and for the elastic constants were derived for a diamond-type lattice in terms of force constants between neighboring atoms. An expression was derived for use in computing the differential cross section for slow neutron scattering by a liquid. A 900-channel pulse analyzer system is being designed for the tandem accelerator. (For preceding period see PR-P-38.) (W.D.M.)

4818 SCR-53
Sandia Corp., Albuquerque, N. Mex.
EXPLODING-WIRE PHENOMENA—BIBLIOGRAPHY. W. H. Richardson, comp. Nov. 1958. 24p. Contract AT(29-1)-789. $1.00(OTS).

The survey includes 273 references from books, periodicals, and reports through April 1958. It includes early material on basic physics and properties of materials. Two items cover a large part of the field. One is W. M. Conn's article and bibliography in Zeitschrift für Angewandte Physik, 1955. The other is William G. Chace's bibliography published by the Cambridge Research Center—GRD-TM-57-5, November 1956. The additional references were selected from Physics Abstracts, Electrical Engineering Abstracts, Chemical Abstracts, U. S. Government Research Reports, and a demand bibliography from ASTIA. (auth)

4819 SCTM-76-58(52)
Sandia Corp., Albuquerque, N. Mex.
THE MIDOT SYSTEM. (Multiple Interferometer Determination of Trajectories). T. L. Pace, T. V. Crawley, V. W. Hansen, and C. B. Rogers. Dec. 12, 1958. 24p. Contract AT(29-1)-789. $4.80(ph OTS); $2.70(mf OTS).

An electronic trajectory-measuring system based on radio interferometry techniques is described that is capable of simultaneously tracking a number of airborne test vehicles. The data input of the system is a series of amplitude nulls that represent ambiguous direction cosines. A method for resolving the ambiguities is discussed. The data reduction and GDOP (Geometrical Dilution of Precision) considerations are also presented. (auth)

4820 SCTM-314-58(51)
Sandia Corp., Albuquerque, N. Mex.
SOLID AND SOLID-LIQUID PHASES IN WIRES AT HIGH CURRENT DENSITIES. M. E. Meeker. Aug. 29, 1958. 35p. Contract AT(29-1)-789. $6.30(ph OTS); $3.00(mf OTS).

An experimental and theoretical study of the energy balance in the early stages of the explosion of metal wires by high currents is described. As the metal is heated, it may pass through several crystalline states and will eventually melt and vaporize. The primary interest is in the phenomena up to and including the melting process. Among the phenomena studied are the magnetic pressure, the inertial pressure, the transient skin effect, heat conduction to the ends of the wire, and, in the case of nickel wire, the energy required to reach the Curie point. A detailed study of possible experimental errors and limits of uncertainty is also reported. (auth)

4821 SCTM-399-58(51)
Sandia Corp., Albuquerque, N. Mex.
FITTING A FAMILY OF CURVES TO SCALED DATA OF CRATER RADIUS VERSUS DEPTH OF BURST. L. H. Koopmans. Nov. 17, 1958. 21p. Contract AT(29-1)-789. $3.30(ph OTS); $2.40(mf OTS).

A method is proposed for fitting a four-parameter family of gamma functions to scaled data of crater radius versus depth of burst for HE in different soil media using a modification of the usual least-squares technique of curve fitting. An example is worked out in detail for desert alluvium soil, and programs for running most of the calculations on the IBM-610 are included. (auth)

4822 UCRL-5335(Add.)
[California. Univ., Livermore. Radiation Lab.]
Addendum to THE SELF-CONSISTENT FIELD OF SINGLE-TYPE ELECTRONS IN A UNIFORM MAGNETIC FIELD. Lewi Tonks. Sept. 1958. 3p. Contract [W-7405-eng-48]. $1.80(ph OTS); $1.80(mf OTS).

4823 UCRL-5442
California. Univ., Livermore. Radiation Lab.
BREMSSTRAHLUNG THEORIES SINCE 1945. Glenn R. Maynard and Zanler Lane. Dec. 22, 1958. 8p. Contract [W-7405-eng-48]. $1.80(ph OTS); $1.80(mf OTS).

References are taken largely from Physics Abstracts, Chemical Abstracts, and Nuclear Science Abstracts regarding theories advanced since Bethe and Heitler with emphasis on high-energy, external bremsstrahlung. (auth)

4824 UCRL-8417
California. Univ., Berkeley. Radiation Lab.
NOTES ON STATISTICS FOR PHYSICISTS. Jay Orear. Aug. 13, 1958. 34p. Contract W-7405-eng-48. $1.00 (OTS).

This survey of statistical principles intended for the use of physicists contains sections on the following subjects: direct probability; inverse probability; likelihood ratios; maximum-likelihood method; Gaussian distribution; one-parameter maximum-likelihood error; maximum-likelihood errors, M parameters, and correlated errors; propagation of errors and the error matrix; systematic errors; uniqueness of maximum-likelihood solution; confidence intervals and their arbitrariness; Bartlett S function; binomial and Poisson distributions; extended maximum-likelihood method; least-squares fit; and goodness of fit. Prediction of likelihood ratios and distribution of the least-squares sum are included in the appendixes. (L.T.W.)

4825 UCRL-8523
California. Univ., Berkeley. Lawrence Radiation Lab.
A PRACTICAL GUIDE TO THE METHOD OF LEAST SQUARES. Peter Cziffra and Michael J. Moravscik. Oct. 17, 1958. 23p. Contract W-7405-eng-48. $0.75 (OTS).

This report gives a short and practical summary of curve fitting by the method of least squares. The purpose is to list and roughly justify the formulas used in finding the best fitting curve, the errors, and the quantities which describe the goodness of the fit. (auth)

4826 WADC-TR-55-500(Pt.III)
Bausch and Lomb Optical Co., Rochester, N. Y.
INVESTIGATION OF INFRARED TRANSMITTING MATERIALS. Period Covered: January 1957 to January 1958. Norbert J. Kreidl, Harold C. Hafner, Joseph R. Hensler, and Robert A. Weidel. Aug. 8, 1958. 150p. Project title: CERAMIC AND CERMET MATERIALS. Task title: CERAMIC AND CERMET MATERIALS DEVELOPMENT. Contract AF33(616)-2769. (AD-202842).

The water absorption band at 2.7 to 3.0μ in calcium aluminate glasses is undesirable, so methods to eliminate it were studied. Techniques successful in silicate glasses were not applicable to the calcium aluminates. For example, D_2O added to a silicate glass batch shifted, as expected, the water absorption band to approximately 3.7μ. A similar addition to a calcium aluminate batch produced no change in the position of the water absorption band. Techniques were developed for protecting the surfaces of calcium aluminate glasses from deterioration by water or water vapor. These glasses were "hardened" by conventional techniques. "Hardening" did not inhibit moisture attack. The infrared transmission of typical calcium aluminate glasses changed slightly after exposure to 1×10^7 rep gamma radiation from a Co^{60} source. (auth)

4827 AEC-tr-3502
ELEMENTS OF THE THEORY OF MIRROR SCANNING. A. S. Dubovik. Translated for Los Alamos Scientific Lab. from Zhur. Nauch. i Priklad. Fot. i Kinematografii 2, 293-303(1956). 11p.

Certain questions of practical importance in mirror scanning theory are examined, and methods for calculating mirror scanning systems are given. Elements of the theory of mirror scanning in the general form are propounded, and the locus of the image is derived. A graphical method of constructing the locus of the image in the general case is given. The replacement of the complex form of the locus of the image by easily manufactured forms such as a plane and the surface of a right circular cylinder is discussed, and methods are derived for effecting this. The question of the rate of motion of the image in the general case is considered. The possibility of obtaining uniform motion of the image in the general case of mirror scanning is examined. (W.D.M.)

4828 AEC-tr-3510
THE ELECTRIC AND THERMOELECTRIC PROPERTIES OF INDIUM ANTIMONIDE. Jan Tauc and Milos Matyas. Translated by Eva Hanka (Ames Lab.) from Czechoslov. J. Phys. 5, 369-83(1955). 27p.

The results of measurements of the differential thermoelectric forces, the electric conductivity, and the Hall coefficient in indium antimonide are presented. The experimental techniques are described together with a discussion of the theory. It is concluded that in intrinsic conduction the distribution of electrons by thermal waves of the lattice prevails, and donors probably do not possess a determined energy of activation. The allowed quantities of energy of electrons of donors form a band which overlaps the conduction band. In addition, it was found that the effective mass of electrons does not depend on temperature at 150 to 700°K, and it equals 3.6×10^{-2} m. (J.R.D.)

4829 AEC-tr-3526
PROGRESS OF SCIENTIFIC WORK ON ROCHELLE SALT ELECTRICITY. E. I. Mamonov. Translated for Oak Ridge National Lab. from Priroda No. 8, 113-15 (1958). 5p.

A review of development in the field of piezoelectrics is presented. Among the present applications of these materials is in electromechanical transformers, stabilizers, dielectric amplifiers, low-clearance condensers with a dependence of the capacity on the applied electric field, and high-speed computers. In addition, a summary is presented of the papers given at the All-Union Conference on Piezoelectricity, including the results of theoretical and experimental investigations. (J.R.D.)

4830 CEA-tr-A440
MÉTHODES DE MESURE DE TEMPÉRATURES A VARIATIONS RAPIDES. (Methods of Measuring Temperatures with Rapid Variations.) W. Heinrich and F. Peschke. Translated from Technik (Berlin) 12, 532-40(1957). 43p.

A review is given of the more important methods used to measure the temperature of phenomena with rapid variations. In these methods the intensity of spectral radiation is used. They permit, by using multipliers as radiation receptors, registering of temperature variations almost without inertia. The existence of thermal equilibrium is one necessary condition to their operation. (tr-auth)

4831 CEA-tr-I20
MESURE DE LA TEMPÉRATURE MAXIMA D'UN BARREAU CYLINDRIQUE MASSIF D'URANIUM, GAINÉ AVEC UN TUBE D'Al 2S, DANS LEQUEL EXISTE UNE GÉNÉRATION UNIFORME DE CHALEUR. (Measurement of the Maximum Temperature of Massive Cylindrical Bars of Uranium Clad with a Tube of Al 2S, in Which There Exists a Uniform Generation of Heat.) G. Franco and A. Pedretti. Translated by L. Roulet from Report CISE-50, 1955. 25p.

Experiments are described which are the beginning of a series of studies in the development of a cladding

for a solid U fuel element for a reactor cooled and moderated by heavy water at low temperature. The U cylinder is about 25 mm in diam., and the maximum thermal flux at the U surface will be of the order of 50 watts/cm^2. These experiments were performed on a U rod 22.7 mm × 270 mm long with a 1.8 mm cladding of 2S Al applied by cold drawing. The heating was accomplished by the Joule effect using the secondary of a monophase 280-v 50-cycle transformer with an output of 40 kva at a maximum current of 10,000 amps. The experiments show that the fuel element, from a thermal and mechanical viewpoint, will be satisfactory. The results depend, however, upon the effects of radiation and fission product buildup. (T.R.H.)

4832 CEA-tr-R223
AU SUJET DES ONDES ÉLECTROACOUSTIQUES DE PLASMA DANS LA DÉCHARGE GAZEUSE. (Electroacoustical Waves of Plasma in Gaseous Discharge.) M. V. Koniukov and Ia. P. Terletzky. Translated by B. de Trezvinsky from Zhur. Eksptl'. i Teoret. Fiz. 27, 541-8(1954). 13p.

On the basis of the system of hydrodynamic equations for the electrical and ionic gas and of the electrodynamic equations, the problem of the propagation of electroacoustical waves in plasma is resolved. It is shown that by considering the friction on the neutral gas and the origin of particles following ionization, two types of waves, propagated the length of the axis of the discharge tube, can exist during the symmetric cylindrical discharge. These are the electronic waves and the ionic waves. The first are shown as rapidly damped and the second as also damped with increasing amplitude. (tr-auth)

4833 CEA-tr-R284
DÉTERMINATION DE L'ÉPAISSEUR DES COUCHES D'OXYDE SUR LES ALLIAGES D'ALUMINIUM. (Determination of the Thickness of Oxide Layers on Aluminum Alloys.) V. P. Borzov and E. V. Ilina. Translated from Izvest. Akad. Nauk, Ser. Fiz. 19, 207-8(1955). 5p.

The thickness of oxide layers on Al alloys was measured by the relative intensities of the Cr II 2835.6 A and Al III 2816.2 A lines from the $K_2Cr_2O_7$ filling the pores in an Al alloy sample. It was assumed that the pores were completely filled to a uniform depth. Results are given for Al-8 alloy and duralumin. The probable error was ±3% when compared with the gravimetric and metallographic methods. (T.R.H.)

4834 CEA-tr-R332
COEFFICIENT D'UTILISATION DES NEUTRONS THERMIQUES DANS UN RÉSEAU SERRÉ. (Coefficient of Utilization of Thermal Neutrons in a Dense Lattice.) Ya. (Ia.) V. Chevelev. Translated by J. Miletic from Atomnaya Energ. 2, 217-23(1957). 21p.

By use of the diffusion approximation, the thermal utilization factor for a lattice of cylindrical bars of fuel was calculated. It was shown that, for a sufficiently symmetrical lattice (identical blocks distributed at the vertices of a hexagon, square, or equilateral triangle), the use of the equivalent cell method gives a good approximation, even if the blocks are completely packed together. (tr-auth)

4835 CEA-tr-R382
SCINTILLATEURS EN MATIÈRE PLASTIQUE AVEC ADDITION DE COMPOSÉS DU GROUPE DES OXAZOLES. (Scintillators in Plastic Material with the Addition of the Oxazole Group.) M. N. Medvedev, E. N. Matveeva, and L. Ya. Zhiltzova (Jiltzova). Translated by [B.] Vinogradoff from Pribory i Tekh. Eksp., No. 1, 55-7(1957). 10p.

Results are given of measurements of the amplitude of pulses from an FEU-19-M counter, which are produced by plastic scintillators (polystyrene) containing compounds of the oxazole group. The pulse amplitude versus concentration of additive data show that 2-phenyl-5(4-biphenyl)-1,3,4-oxydiazole (PBD), 2-(-4-biphenylyl)-5-phenyloxazole (BPO), 1,4-di(2-5-phenyloxazolyl)-benzene (POPOP), and 2(1-naphthyl)-5-phenyloxazole (α-NPO) give pulse amplitudes 0.67 times that of stilbene for concentrations of 1 to 1.5%. Polystyrene scintillators with p-terphenyl plus 0.02 to 0.1% POPOP and α-NPO give pulse amplitudes of 0.80 (same units). The duration of luminescence of plastic scintillators with POPOP and α-NPO is about 2×10^{-9} sec with ultraviolet excitation. (T.R.H.)

4836 CEA-tr-R488
PRISE EN CONSIDÉRATION DU CARACTERE NON ISOTHERMIQUE DU FLUX PENDANT L'ÉCOULEMENT LAMINAIRE DES FLUIDES INCOMPRESSIBLES DANS LES TUBES. (The Non-Isothermal Character of the Flux During the Laminar Outflow of Incompressible Fluids in Tubes.) E. A. Sidorov. Translated by B. de Trezvinsky from Zhur. Tekh. Fiz. 27, 327-30(1957). 8p.

An approximation is given for the ranges of velocities and temperatures relative to laminar flow of incompressible liquids in tubes, taking into account the variation of viscosity with temperature. (tr-auth)

4837 CEA-tr-R497
ETUDE DES CONDITIONS OPTIMA POUR LA RÉALISATION DES CYCLES THERMODYNAMIQUES DANS LES CENTRALES NUCLÉAIRES. (Study of the Optimum Conditions for the Realization of Thermodynamic Cycles in Nuclear Power Stations.) D. D. Kalafati. Translated by B. Vinogradoff from Atomnaya Energ. Suppl. 1, 164-75(1958). 22p.

Fuel costs, electric power production, and reactor operating temperatures are considered in establishing expressions for finding the optimum thermodynamic cycle of a nuclear power station. (T.R.H.)

4838 NP-tr-200
ON PERTURBATION THEORY OF A CONTINUOUS SPECTRUM. O. A. Ladyzhenskaya (Ladyzhenskaia) and L. D. Fadeev. Translated for Lincoln Lab., MIT from Doklady Akad. Nauk S.S.S.R. 120, 1187-90(1958). 6p.

An integral equation is discussed which occurs in the analysis of the character of the spectrum for the operator $L = L_0 + \epsilon K$, where L_0 is the operator of multiplication by an independent variable in the Hilbert space of abstract functions and K is an integral operator. (L.T.W.)

4839 SCL-T-212
BALL LIGHTNING OBSERVATIONS. (Kugelblitzbeobachtungen.) Martin Rodewald. Translated by Marcel I. Weinreich (Sandia Corp.) from Z. Meteorol. 8, 27-9 (1954). 10p.

Various observations of ball lightning are related which have been properly recorded and witnessed. The observations took place around Hamburg, Germany, and date back to 1895. (W.D.M.)

4840 TT-766
THE NEUTRON COMPONENT OF COSMIC RADIATION. (Die Neutronenkomponente der Ultrastrahlung.)

G. Pfotzer. Translated by D. A. Sinclair (National Research Council of Canada) from Naturwissenschaften 39, 149-58(1952). 34p.

This paper was previously abstracted from the original language and appears in NSA, Vol. 6, abstract No. 3595.

4841

METHOD FOR THE DETERMINATION OF THE MASS AND ENERGY OF IONIZING PARTICLES BY MEANS OF NUCLEAR EMULSIONS. II. M. Petrascu and K. Besliu. Acad. rép. populaire Roumaine, Rev. phys. 2, 229-32 (1957). (In Russian)

The limitations of the method are analyzed from the point of view of statistical criteria. The grain density in an unexposed Ilford G-5 plate is measured for a group of 6 protons with tracks ending in the plate with N < 5000. The dispersion σ^2 was calculated at 1000-grain intervals. Results are tabulated. (R.V.J.)

4842

HYPERFRAGMENTS. W. F. Fry (Univ. of Wisconsin, Madison). Ann. Rev. Nuclear Sci. 8, 105-26(1958).

Background is given on the identification and production of hyperfragments. Decay modes, lifetime, and binding energy are discussed. (W.D.M.)

4843

GAMMA-RAY SPECTROSCOPY BY DIRECT CRYSTAL DIFFRACTION. Jesse W. M. DuMond (California Inst. of Tech., Pasadena). Ann. Rev. Nuclear Sci. 8, 163-180 (1958).

Crystal diffraction γ-ray spectroscopy has been accomplished almost entirely by means of transmission-type spectrometers using bent quartz crystal focusing. A review is presented of the bent crystal and two-crystal spectrometers. The design and performance of the California Institute of Technology spectrometer are discussed. Applications of crystal diffraction γ-ray spectrometers are given. (W.D.M.)

4844

THE PRIMARY RADIATION. H. V. Neher (California Inst. of Tech., Pasadena.). Ann. Rev. Nuclear Sci. 8, 217-242(1958).

The first concern of this review is with the species of nuclei represented in the primary cosmic radiation, i.e., their chemical composition both as to kind and numbers. Their energy distribution is considered, and the various kinds of fluctuations that occur in the primaries are discussed. A brief account is given of some of the present ideas about the origin of cosmic rays and of some of the astrophysical implications. (W.D.M.)

4845

NUCLEAR ASTROPHYSICS. A. G. W. Cameron (Atomic Energy of Canada, Ltd., Chalk River, Ont.). Ann. Rev. Nuclear Sci. 8, 299-326(1958).

The investigations of nuclear reactions which might be expected to occur under various conditions in stellar interiors have resulted in a quantitative theory of the origin of the elements. A review of this theory is presented along with evidence supporting it. (W.D.M.)

4846

THE DIFFUSE SCATTERING OF X-RAYS IN IR-RADIATED DIAMOND, CORUNDUM, SILICON, AND GERMANIUM CRYSTALS. S. T. Konobeevskii and F. P. Butra. Atomnaya Energ. 5, 572(1958). (In Russian)

X-ray diffusion scattering in crystals of diamond, corundum, silicon, and germanium irradiated in a reactor by a flux of fast neutrons (5.5×10^{19} neutrons/cm^3, E > 1 Mev) at 80°C was studied. (R.V.J.)

4847

THE CALCULATION OF THE GAMMA SHIELDING PROTECTION IN EXPANDING RADIATION FIELDS. Rolf Plesch (Wernerwerk für Messtechnik, Karlsruhe, Ger.). Atompraxis 4, 402-7(1958). (In German)

The usual, purely exponential calculation of shield thicknesses for gamma radiators supplies minimum values which in many cases cannot provide the desired protection, since the influence of secondary radiation caused by single or multiple Compton processes is not taken into consideration in the exponential calculation. By applying the dose build-up factor B, which can be represented in close approximation as a function of the shield thickness A, the influence of scattered radiation can be taken into account; the maximum values thus obtained for shield thickness result in adequate radiation protection. Two diagrams are given for these values, using lead as shield material. Another diagram makes possible the calculation of equivalent iron thicknesses. By introducing a specific identification number K for each problem in radiation protection, the diagrams can be used freely for various protection conditions. It is shown how to determine shield thickness for complex gamma-radiators (radiation mixtures), and in conclusion all the processes are illustrated by practical examples. (auth)

4848

AN ISOTOPE EFFECT IN ANTIFERROMAGNETISM AT LOW TEMPERATURES. J. M. Daniels (Univ. of British Columbia, Vancouver). Can J. Phys. 37, 75-7 (1959) Jan.

The investigation shows that the macroscopic properties of the antiferromagnetic state can be greatly influenced by the isotopic composition of the paramagnetic ions, because the hyperfine coupling between the unpaired electron and the nuclear spins of the paramagnetic ions can be much larger than the coupling between individual ions. (A.C.)

4849

PRODUCTS OF COSMIC RADIATION IN SIKHOTE-ALIN METEORITE. E. K. Gerling and L. K. Levskii (Lab. of Pre-Cambrian Geology, Academy of Sciences, USSR). Doklady Akad. Nauk S.S.S.R. 123, 420-3(1958) Nov. 21. (In Russian)

The relative isotopic composition of inert gases (He, Ne, and Ar) was studied in individual specimens from a meteorite shower, and changes in composition with depth were studied in large specimens of Sikhote-Alin meteorite. The results of the analysis are tabulated. (R.V.J.)

4850

ON THE AGE OF METEORITES. I. E. Starik, M. M. Shats, and E. V. Sobotovich (Radium Inst., Academy of Sciences, USSR). Doklady Akad. Nauk S.S.S.R. 123, 424-6(1958) Nov. 21. (In Russian)

Special tests were made for determining the uranium in meteorites, and the results of experiments made on various specimens of stone and pallasite meteorites are tabulated. The age of stone meteorites was calculated and tabulated according to ratios of Pb^{206}/U^{238}, Pb^{207}/U^{235}, and Pb^{207}/Pb^{206}. (R.V.J.)

4851

ON THE THERMODYNAMICS OF SUPERCONDUCTIVITY. V. A. Moskalenko (Lomonosov Moscow State

Univ.). Doklady Akad. Nauk S.S.S.R. 123, 433-6(1958) Nov. 21. (In Russian)

A Hamiltonian variational method for phase transitions in superconductors was developed by proceeding directly from the Freilich Hamiltonian. Results were compared with previous works based on Hamiltonian model variations for thermodynamics of superconductivity. (R.V.J.)

4852

ON THE COEFFICIENT OF ABSORPTION (ATTENUATION) OF β-RAYS IN SEMICONDUCTORS. B. I. Boltaks and V. I. Sokolov (Inst. of Semiconductors, Academy of Sciences, USSR). Doklady Akad. Nauk S.S.S.R. 123, 446-8(1958) Nov. 21. (In Russian)

The relations between the mass coefficient of β-ray absorption and certain properties and structures of semiconducting materials were studied on specimens of Ge, S, Se, Te, CdTe, GaSb, HgSe, InSb, PbTe, ZnTe, and the alkali halide compounds CuBr, KBr, KCl, KI, and NaCl. Radioactive isotopes Ca^{45}, P^{32}, S^{35}, Sr^{90}, Te^{204}, and W^{185} with simple β spectra were used as β sources which allowed recordings in a wide range of energies (from 0.169 to 1.701 Mev). (R.V.J.)

4853

POTASSIUM–ARGON AGE OF IRON METEORITES. R. W. Stoenner and J. Zähringer (Brookhaven National Lab., Upton, N. Y.). Geochim. et Cosmochim. Acta 15, 40-50(1958) Nov.

The K^{41} and Ar^{40} have been determined in seven specimens of five falls of iron meteorites. The measured Ar^{40} content was found to be principally radiogenic in origin and associated with the potassium. Under the usual assumptions accepted for this method, ages have been calculated and found to be close to 10×10^9 years, which is about twice the reported age of stone meteorites, and also higher than the supposed age of the universe. (auth)

4854

THE ISOTOPIC COMPOSITION OF ROCKS OF THE EARTH AND OF METEORITES. A. P. Vinogradov. Geochim. et Cosmochim. Acta 15, 80-90(1958) Nov.

The results of a comparative study of the isotopic composition of the cosmic materials accessible to direct investigation, of the deep igneous rocks of the earth, and of the stony and iron meteorites are discussed. (J.E.D.)

4855

THE A^{38} CONTENT OF TWO POTASSIUM MINERALS. G. J. Wasserberg and R. Bieri (California Inst. of Tech., Pasadena and Univ. of Minnesota, Minneapolis). Geochim. et Cosmochim. Acta 15, 157-9(1958) Nov.

Gerling, Levskii, and Afanasyeva (Doklady Akad. Nauk S.S.S.R. 109, 813-15(1956)) presented evidence indicating the presence of Ar^{38} in potassium micas and feldspars. Their data indicate that the Ar^{38}/K ratio is constant for potassium minerals of a given age and that this ratio increases regularly with the age of the sample. The observed data may be explained by assuming that K^{38} occurs in nature with an abundance of $K^{38}/K = 1 \times 10^{-10}$ and that K^{38} has a long-lived isomeric state ($K^{38} \rightarrow Ar^{38} + \beta^+$; $T_{1/2} = 7.7 \times 10^8$ yr). Because of the implications of these conclusions, the present research on the Ar^{38} content of a muscovite mica and a lepidolite was carried out. The data indicate that the value of λ of K^{38} given by Gerling et al. is too large by an order of magnitude. (L.T.W.)

4856

RADIATION SHIELDING CONCRETE. E. Trudsø. Ingeniøren 67, No. 7, 239-56(1958) Apr. (In Danish)

The article is intended as a brief digest of representative literature about radiation shielding with concrete. Part I contains a summary of related physical definitions and terminology, and in Part 2 a synopsis is given of the technology of concrete shields, the choice of aggregate and additives, the proportioning of mix, structural shape selection, and the methods of placing the concrete. Twenty-one different concrete mixes and three methods of placing the concrete (conventional, prepacked, puddled) are tabulated, together with resulting mechanical properties. (tr-auth)

4857

ON THE SPATIAL DISTRIBUTION OF THE GAMMA-RAY DOSE FROM A PLANE SOURCE. Intern. J. Appl. Radiation and Isotopes 4, 109-11(1958) Dec.

Calculations and measurements are presented for use in calculating the spatial distribution of the gamma-ray dose from a plane source. (C.H.)

4858

MICRO COUNTER TUBES FOR BETA-GAMMA MEASUREMENTS. G. L. Locher (Western Radiation Lab., Los Angeles). Intern. J. Appl. Radiation and Isotopes 4, 112-16(1958) Dec.

Beta-gamma sensitive micro counter tubes of the Maze type were developed for radioisotope tracer work. The tubes can be sterilized and used in humans for medical diagnosis by radioisotope uptake and for biological research. Flexible lead wires are hermetically sealed to the metal-encased glass tubes. Volumes range from 2 mm^3 to 850 mm^3, and wall thicknesses range from 0.4 Mev to 0.2 Mev. Thinner windows have been made in some types. Life is $>10^7$ counts, with helium filling. Practical beta detection sensitivity is 0.001 to 0.01 μc at 1.0 cm distance in air. Similar tubes 1.0 mm o.d., 6 mm to 30 mm long have been made for interchangeable use in needle-type probes. Techniques of construction and typical β response characteristics to Sr–Y^{90}, Co^{60}, Y^{90}, and Ra γ rays are given. 3 figures. (auth)

4859

ABSOLUTE COUNTING OF β-PARTICLES BY MEANS OF A PLASTIC SCINTILLATOR. B. Grimeland (Joint Establishment for Nuclear Energy Research, Kjeller per Lillestrøm, Norway). Intern. J. Appl. Radiation and Isotopes 4, 116-18(1958) Dec.

A procedure is described for obtaining 4π geometry by the use of a split plastic scintillator. The absolute counting rate is determined by extrapolating to zero voltage the bias curves measured with three different values of the high voltage on the photomultiplier tube. (auth)

4860

DENSITY DETERMINATIONS BY β-RAY ABSORPTION (ERROR CURVES). V. S. Merkulov. Izmeritelnaya Tekh. No. 4, 43-5(1958) July-Aug. (In Russian)

The errors arising in such measurements from statistical fluctuations in counting rate are given for the pure β emitters S^{35}, Pm^{147}, Sr^{90}, Tl^{204}, Pr^{143}, Sr^{89}, P^{32}, Y^{90}, and Cu^{45}. (auth)

4861

ON THE DOPPLER LINE BROADENING IN CONVERSION ELECTRONS EMITTED BY RECOIL NUCLEI.

A. V. Gnedich, L. N. Kryukova, et al. (Lomonosov Moscow State Univ.). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 867-70(1958) July. (In Russian)

Studies were made of the Doppler effect on conversion lines in the transition from the 40-kev level in Tl^{208}, excited by Bi^{212} α decay, to the normal state. The influence of Doppler effect on the shape of conversion lines obtained in a spectrometer depends greatly on the conditions of the experiment. (R.V.J.)

4862

PHASE EQUILIBRIA IN THE ALKALI FLUORIDE–URANIUM TETRAFLUORIDE FUSED SALT SYSTEMS. III. THE SYSTEM NaF–LiF–UF_4. R. E. Thoma, Herbert Insley, B. S. Landau, H. A. Friedman, and W. R. Grimes (Oak Ridge National Lab., Tenn.). J. Am. Ceram. Soc. 42, 21-6(1959) Jan.

The phase equilibrium diagram of the ternary system NaF–LiF–UF_4 is based on evidence from thermal analysis and from microscopic and x-ray analyses of samples obtained from thermal gradient quenching experiments. Temperature-composition relations were established through the temperature interval between the liquidus and a lower limit of about 300°C. All the stable compounds in the binary systems LiF–UF_4 and NaF–UF_4 (including the subsolidus compound NaF·$2UF_4$) display primary phase fields in the ternary system. No ternary compounds of NaF–LiF–UF_4 occur. The following eutectics are to be found in the ternary system: 60 NaF, 21 LiF, 19 mole % UF_4, 480°C; 35 NaF, 37 LiF, 28 mole % UF_4, 480°C; 24.3 NaF, 43.5 LiF, 32.2 mole % UF_4, 445°C; and 24.5 NaF, 29 LiF, 46.5 mole % UF_4, 602°C. The compounds 7NaF·$6UF_4$ and 7LiF·$6UF_4$ display limited solubility in each other. The exact limits of the miscibility gap in the 7NaF·$6UF_4$–7LiF·$6UF_4$ join have not been determined. (auth)

4863

COLLISIONS OF METASTABLE ATOMS. J. B. Hasted (University Coll., London). J. Appl. Phys. 30, 22-4 (1959) Jan.

Collision experiments with He 2^3S and Ne ^3P metastable atoms are described, giving the total collision cross sections of these atoms with He, Ne, Ar at thermal energies and also the absorption cross sections of resonance photons from the He and Ne discharges. The secondary electron yields from He metastable atoms and from resonance photons incident upon W, Mo, and Pt surfaces flashed to 1700°C are compared with the yields from an unflashed Au surface, previously determined absolutely. The rate of rise of yield due to gas contamination is examined. The yields from the flashed surfaces are found to be distinctly smaller than Hagstrum's yields for low-energy positive ions. (auth)

4864

INELASTIC ION-ATOM COLLISIONS. J. B. Hasted (University Coll., London). J. Appl. Phys. 30, 25-7 (1959) Jan.

Ion-atom charge exchange cross sections of incident ion velocity v in the adiabatic region are shown to be proportional to $\exp(-K'\alpha|\Delta E|/v)$ energy defect ΔE. Maximum cross sections of the negative ion-atom detachment collision and certain other inelastic ion-atom collisions are shown to be proportional to the maximum kinetic energy available for internal excitation, $\frac{1}{2}\mu v^2$, where μ is the reduced mass of the system. The semiempirical prediction of cross-section energy dependence is discussed. (auth)

4865

INELASTIC ATOMIC COLLISION PROCESSES. E. Gerjuoy (Univ. of Pittsburgh and Westinghouse Research Lab., Pittsburgh). J. Appl. Phys. 30, 28-33 (1959) Jan.

At nonrelativistic energies, for arbitrarily complicated collisions of distinguishable or indistinguishable particles, with or without rearrangement, correct formal expressions for the cross sections are known and well established. Nonetheless, all inelastic collision cross sections must be estimated, rather than predicted accurately, because even with present high spread computers there is no three-or-more particle collision for which it is practical to solve the Schroedinger equation exactly. The validity of the customary Born approximation, and of other more elaborate approximate calculations, are discussed, mainly with reference to electron excitation cross sections. The evidence suggests that a "compound ion model" of excitation, which is contrasted with the more usual "direct interaction model," may prove helpful in understanding the sharp peaks and other anomalous features in some excitation cross sections near threshold. It is argued briefly that (1) there are reasons to think that at high energies Born approximation is not valid for exchange amplitudes, which are the only amplitudes appearing in excitation involving change of spin multiplicity; (2) there are circumstances when Born approximation becomes increasingly valid as the incident electron energy is decreased. (auth)

4866

ELASTIC CONSTANTS OF THORIUM SINGLE CRYSTALS IN THE RANGE 77-400°K. P. E. Armstrong, O. N. Carlson, and J. F. Smith (Iowa State Coll. Ames.) J. Appl. Phys. 30, 36-41(1959) Jan.

The elastic constants of thorium single crystals were determined at ultrasonic frequencies employing both resonance and pulse-echo techniques. The values at 300°K in units of 10^{11} dyne/cm^2 are, $C_{11} = 7.53$, $C_{12} = 4.89$, and $C_{44} = 4.78$. The constants C_{11} and C_{44} increase and C_{12} decreases with decreasing temperature and extrapolate to 7.79, 4.82, and 5.13, respectively, at 0°K. The Cauchy relation $C_{12} = C_{44}$ occurs, quite probably fortuitously, at 271°K. The anisotropy factor $2C_{44}/(C_{11}-C_{12})$ at room temperature is 3.6 which is comparable to the values for lead and gold. Calculated Poisson's ratios, σ_{100} and σ_{111}, indicate a much stronger resistance to contraction in the close-packed planes than in the less densely packed (100) planes. (auth)

4867

ELECTRICAL BREAKDOWN BETWEEN CLOSE ELECTRODES IN AIR. L. H. Germer (Bell Telephone Labs., Inc., Murray Hill, N. J.). J. Appl. Phys. 30, 46-51 (1959) Jan.

Prebreakdown electron current between electrodes closing at voltages below the minimum which can give breakdown by successive ionization of air molecules was measured by two different methods. This field emission current varies widely in successive experiments, increasing in general with decreasing voltage, with maximum values of the order of 10^{-7} amp. At the small electrode separations characteristic of breakdown at voltages below 300, it is shown that the ions necessary for breakdown come from the anode surface. The number of ions in the space at one time is so small that they cannot cooperate to enhance the gross field at

the cathode, which is a conclusion having important consequences for the theory of breakdown. (auth)

4868

ELECTRON EMISSION AT HIGH FIELDS DUE TO POSITIVE IONS. P. Kisliuk (Bell Telephone Labs., Inc., Murray Hill, N. J.). J. Appl. Phys. 30, 51-5 (1959) Jan.

Two mechanisms have been proposed to account for the observed large yield of secondary electrons in gaseous breakdown at high electric fields. In one of these a single ion in approaching the cathode surface creates a "pass" by decreasing the width of the potential barrier. In the other the increased over-all field due to a large number of ions in the gap is supposed to account for the increased emission. The first effect is re-examined and appears to be effective in the observed breakdowns of extremely small gaps in air. It may also be effective in breakdown at high pressure and in liquid and solid dielectrics. (auth)

4869

NEUTRON DIFFRACTION STUDY OF GYPSUM, $CaSO_4 2H_2O$. Masao Atoji and R. E. Rundle (Iowa State Coll., Ames). J. Chem. Phys. 29, 1306-11(1958) Dec.

Using neutron diffraction data, the crystal structure of gypsum has been refined by Fourier and least squares methods. The hydrogen bond distance was found to be 2.82 A rather than 2.71 A, reported previously. The hydrogen positions are consistent with those obtained from nuclear magnetic resonance. The O—H distance is 0.99 ± 0.03 A, and it appears that the O, H, O atoms are collinear. Infrared and Raman results are discussed in terms of the refined structure. (auth)

4870

ISOTROPIC NUCLEAR RESONANCE SHIFTS. Harden M. McConnell and Richard E. Robertson (California Inst. of Tech., Pasadena). J. Chem. Phys. 29, 1361-5(1958) Dec.

It is shown that isotropic (or average) nuclear resonance shifts for a nucleus in a paramagnetic molecule in solution, and in a polycrystalline solid, can be used to distinguish between Fermi contact and "pseudocontact" contributions to isotropic nuclear-hyperfine interactions. The pseudocontact interaction is that isotropic hyperfine coupling which arises from the combined effects of (electron-spin)-(nuclear-spin) coupling, (electron-orbit)-(nuclear-spin) coupling, and electron spin-orbit interaction. When the magnetic hyperfine interaction between the electronic moment and nuclear spin is approximated by a point dipolar interaction, and the isotropic hyperfine interaction is exclusively pseudocontact, then the isotropic nuclear shift in a polycrystalline solid exceeds the solution shift by the factor $3(g_\parallel + g_\perp)/(g_\parallel + 2g_\perp)$ where $g_\parallel$ and $g_\perp$ are the spectroscopic splitting factors parallel and perpendicular to the molecular symmetry axis. Isotropic shifts due to the Fermi contact interaction are the same for both solid state and solution cases. (auth)

4871

INFRARED SPECTRA OF URANYL NITRATE HYDRATES AND RUBIDIUM URANYL NITRATE. Bryan M. Gatehouse and Alan E. Comyns (University Coll., London and Atomic Energy Research Establishment, Harwell, Berks, Eng.). J. Chem. Soc. 3965-71 (1958) Nov.

The infrared spectra of uranyl nitrate di-, tri-, and hexahydrate have been examined from 3700 to 700 cm^{-1}, with nitrogen of normal isotopic composition and enriched in N^{15}, and most of the bands are assigned. The spectrum of uranyl nitrate hexahydrate is in most respects that of a typical ionic nitrate. The spectra of uranyl nitrate di- and trihydrate are similar to the spectrum of rubidium uranyl nitrate, and all three are closely related to the fluorescence spectrum of cesium uranyl nitrate, studied by Dieke and Duncan. These spectra are all characteristic of compounds having coördinated nitrato-groups, and structures are suggested for the molecules in crystals of the di- and the trihydrate which account for the observed splitting of many of the bands. (auth)

4872

AN INVESTIGATION ON PLASMAS IN EXTERNAL MAGNETIC FIELDS. I. STEADY STATE. G. Schmidt (Israel Inst. of Tech., Haifa). Nuovo cimento (10) 10, 55-67(1958) Oct. 1.

The stationary state of a magnetically confined neutral plasma is investigated. For a rare plasma without particle collisions, a method is developed by which a complete set of plasma equations is established. This is based upon the simultaneous solution of Maxwell's equations and the equations of motion of the particles. As an application of this method, generalized forms of the pressure balance equations are derived. An alternative treatment of this relation on the basis of the Boltzmann equation leads to a general expression, valid also for cases when collisions are not negligible. As an example the plasma equations are solved for a problem, for which the usual first order theory breaks down. (auth)

4873

DETERMINATION OF RADON IN TELLURIC AIR BY MEANS OF NUCLEAR PLATES. G. Aliverti (Istituto Superiore Navale, Naples) and Univ. of Modena, Italy). Nuovo cimento (10) 10, 68-77(1958) Oct. 1. (In Italian)

The comparison of the experimental length distribution of α-particle tracks recorded in a nuclear plate exposed in air containing radon, in equilibrium with its short-lived decay products, with the theoretical distribution accountable only to the α particles emitted from the radioactive atoms existing in the air layer facing the plate (volume effect), enables the discrimination between this effect and the contribution from the tracks of α particles emitted from the film of radioactive atoms deposited at the surface of the same plate (surface effect). The application of this method to the evaluation of the Rn content in telluric air is discussed and experimentally tested. (auth)

4874

NOTE ON TIME-DEPENDENT PERTURBATION THEORY. I-Tung Wang (Univ. of Toronto) and Ta-You Wu (National Research Council, Ottawa). Nuovo cimento (10) 10, 395-7(1958) Oct. 16.

It is pointed out that the formulation of Lippman and Schwinger for perturbation can be generalized for a general class of time-dependent Hamiltonians. (A.C.)

4875

MAGNETIC PROPERTIES OF TERBIUM METAL. W. C. Thoburn, S. Legvold, and F. H. Spedding (Iowa State Coll., Ames). Phys. Rev. 112, 56-8(1958) Oct. 1.

Results of magnetic measurements on metallic terbium over the temperature range from 4° to 375°K and in fields ranging from 50 oersteds to 18,000 oersteds

are reported. The metal is found to have a paramagnetic Curie point of 237°K. Tests with fields of from 50 to 800 oe indicate an order-to-disorder transition at approximately 230°K which is evidently a Néel point. It appears that terbium has a weakly bound antiferromagnetic ordering for temperatures between 218° and 230°K, this ordering being gradually changed to ferromagnetic in fields exceeding 200 oe. Below 218°K the metal is ferromagnetic. The magneton numbers obtained from the paramagnetic susceptibility measurements and from the extrapolated ferromagnetic saturation moment are in good agreement with values calculated for the free ion. (auth)

4876

THE GRAVITY FIELD OF A PARTICLE. Charles Darwin. Proc. Roy. Soc. (London) A249, 180-94(1959) Jan. 1.

Einstein's equations for the orbits around an attracting point mass, here called the sun, are examined to see whether there are orbits which end in the sun, as there are in the corresponding case of electrical attraction when relativity is allowed for. With the measure of the radius as usually taken, it is shown that no hyperbolic orbit can have perihelion inside r = 3m, and an elliptic orbit cannot have perihelion inside r = 4m. Particles going inside these distances will be captured. Circular orbits are possible for any greater radius. If $3m < r < 4m$ the orbit is unstable; with one disturbance it falls into the sun, with the opposite it escapes in a spiral to infinity. If $4m < r < 6m$, it is also unstable, either falling into the sun, or moving out to some aphelion at a greater radius before returning to its circle. Only if $r > 6m$ is the orbit stable. A study is made of the travel of light rays. No light ray from infinity can escape capture unless its initial asymptotic distance is greater than $3\sqrt{3}m$. A field of stars surrounds the sun, and is viewed in a telescope pointed at the sun from a distance. If the field as seen is mapped as though in a plane through the sun, each star, in addition to its direct image, will show a series of faint 'ghosts' on both sides of the sun. The ghosts all lie just outside the distance $3\sqrt{3}m$. A few technical details are given about the orbits of the captured particles. (auth)

4877

INTERNAL RUPTURE OF BONDED RUBBER CYLINDERS IN TENSION. A. N. Gent and P. B. Lindley. Proc. Roy. Soc. (London) A249, 195-205(1959) Jan. 1.

An unusual rupture process is described. It consists of the sudden appearance of internal cracks in bonded rubber cylinders at a well-defined and comparatively small tensile load. The cracks occur in all the vulcanizates examined, and in particularly weak rubbers are found to cause failure. Their appearance may also lead to marked changes in the load-deflection relationship. A theoretical treatment is presented on the basis of a proposed criterion for crack formation. It is assumed that they form when the negative hydrostatic pressure component of the applied stress reaches a critical value. It is shown by means of the theory of large elastic deformations that a critical value of the negative pressure exists at which any cavity in the rubber will burst, and the calculated value is shown to be in satisfactory agreement with experiment. Moreover, the theory successfully predicts the observed dependence of the cracking stress on the Young's modulus of the rubber, its virtual independence of the rubber strength and extensibility, and the general form of the observed variation of cracking stress and crack disposition with the thickness of the test-piece. (auth)

4878

EXCITATION TEMPERATURE MEASUREMENTS IN GLOW AND ARC DISCHARGES IN HYDROGEN. H. Edels and W. A. Gambling (Univ. of Liverpool). Proc. Roy. Soc. (London) A249, 225-36(1959) Jan. 1.

Experiments on high-pressure glow discharges in hydrogen have shown that by either increasing the current or gas pressure of the discharge, a sudden marked column constriction can be produced which results in the formation of an arc column. It was also found that this columnar glow-to-arc transition could be induced or reversed by control of the thermal conditions of the discharge, indicating that the transition depends upon the discharge temperature values. The relative intensities of the α, β, and γ Balmer lines emitted by the discharge column section in hydrogen were measured, and the variation of the excitation temperatures $T_{\alpha\beta}$ and $T_{\beta\gamma}$ through the discharge transition region was derived. The radiation measurements were made using a photomultiplier technique and yielded derived temperature values accurate to ±3%. Temperatures were obtained for currents between 0.25 and 10 A and for pressures from 0.33 to 2 atm. In all cases, except at 2 atm, the current range included the transition condition. The results show that with current variation the excitation temperature curves always exhibit minima at the transition current, even though the latter is changed by the change in pressure conditions. Further, the values of the minima are constant at 3900 ± 100°K for $T_{\alpha\beta}$ and 2800 ± 100°K for $T_{\beta\gamma}$. A thermally dependent mechanism of arc column formation in hydrogen is indicated. The results also show that when the column is in the glow state $T_{\alpha\beta} > T_{\beta\gamma}$. It is concluded that in the glow state the distribution of excited state concentrations is nonthermal, being mainly governed by electron collisions. Above the transition current value the results show that the excitation temperatures rapidly converge, so that for the arc a thermal distribution of concentrations exists in the quantum states n = 3, 4, and 5. However, from considerations of the derived values of electron concentration and electron drift velocity and from calculations of the excess of the electron temperature over the gas temperature, true thermal equilibrium does not exist in the newly formed low-current arc column in hydrogen. The transition in the column from glow to arc is explained in terms of the change in effective thermal conductivity produced by the variations of dissociation with temperature. (auth)

4879

THEORY OF THE TEMPORAL GROWTH OF IONIZATION IN GASES, INVOLVING THE ACTION OF METASTABLE ATOMS AND TRAPPED RADIATION. P. M. Davidson (University Coll. of Swansea, Wales). Proc. Roy. Soc. (London) A249, 237-47(1959) Jan. 1.

There exists no accurate mathematical treatment of the temporal growth of ionization current in a gas due to the primary α ionization process, together with the action of metastable atoms liberating electrons from the cathode as the significant secondary process. Such a treatment is presented. The continuity equation and boundary conditions are derived, and the solution for the steady state is obtained, showing how the Townsend steady-state formula is modified when this process involves metastable atoms with some internal destruction in the gas. To derive formulas for temporal growth, a

contour integral is introduced, from which the required solution is obtained in various exact forms. Approximate formulas are also obtained for calculating both the initial and later stages of the current growth in various practical cases. Another well-known secondary cathode process is that due to fluorescent light, that is, to photons which have been repeatedly absorbed by atoms and re-emitted. Thus, like metastable atoms, they move through the gas by a process of diffusion. Formulas for the resulting current growth are derived. The general case in which, in addition to these diffusion processes, there is secondary cathode action due to unscattered photons and positive ions is also treated. (auth)

4880

ABSORBED DOSE AND LINEAR ENERGY TRANSFER IN RADIATION EXPERIMENTS. M. Danzker, N. D. Kessaris, and J. S. Laughlin (Sloan-Kettering Inst., New York). Radiology 72, 51-61(1959) Jan.

The significance of the total and primary degraded electron spectra is discussed, and the application of the theory developed by Fano and Spencer to the calculation of total electron spectra is illustrated for irradiation of water by the following x-ray doses: 130 kvcp, 5 mm Al hvl; 200 kvcp, 0.5 mm Cu hvl; 250 kvcp, 1 mm Cu hvl; 250 kvcp, 2mm Cu hvl; 1 Mevp, 3.4 mm Pb hvl; Co^{60} gamma rays; 25 Mevp betatron x rays. The significance of absorbed dose is discussed. The absorbed dose relative to the roentgen (D/r) and to cavity ionization (D/J) with absorbing materials of water, Lucite, and polystyrene is calculated and tabulated. The linear energy transfer (LET) distributions produced by the continuous electron spectra are shown graphically. (auth)

4881

BROAD BEAM ATTENUATION IN CONCRETE FOR 50 TO 300-Kvp X-RAYS AND IN LEAD FOR 300-Kvp X-RAYS. E. Dale Trout, John P. Kelley, and Arthur C. Lucas. Radiology 72, 62-7(1959) Jan.

Measurements were made of the attenuation in concrete of broad beams of 50 to 300-kvp x rays and in lead of 300-kvp x rays. Attenuation data were also obtained for an aluminum barrier. Data are presented graphically. A table of lead–concrete equivalents and a table of half-values in concrete and lead for various voltages are included. (C.H.)

4882

THE PROBLEM OF FOCUSING OF A HOLLOW CYLINDRICAL ELECTRON BEAM IN A LONGITUDINAL MAGNETIC FIELD. L. E. Bakhrakh and I. Sh. Kozel'. Radiotekh. i Elektron. 3, 819-25(1958).

An attempt is made to investigate the problem of focusing a hollow cylindrical electron beam in the absence of an axial conductor inside the beam. The problem is analyzed with the assumption that the magnetic field is axially symmetric, its longitudinal component is independent of the radial distance, and the wave length of the axial change of the surface of the electron beam is large in comparison with its diameter. (TCO-J.S.R.)

4883

RADIATION ATTENUATION METHOD OF MEASURING DENSITY OF A TWO-PHASE FLUID. Michael Petrick and Bernet S. Swanson (Argonne National Lab., Lemont, Ill.). Rev. Sci. Instr. 29, 1079-85(1958) Dec.

A gamma-ray attenuation technique is presented for measuring density and phase distribution in a two-phase fluid. A comparison is made between a "one-shot" and traverse method. The technique was evaluated on Lucite mock-ups of simulated flow patterns encountered in two-phase flow and by a series of tests on an air-water system at atmospheric pressure. (auth)

4884

USE OF POLYSTYRENE AS AN X-RAY ABSORBER; THE MASS ABSORPTION COEFFICIENT OF CARBON. Boris W. Batterman (Bell Telephone Labs., Inc., Murray Hill, N. J.). Rev. Sci. Instr. 29, 1132(1958) Dec.

The advantages of using polystyrene as an x-ray absorber are pointed out. The measured linear absorption coefficient for both commercial rod and high-purity molded sheet was found to be 4.165 ± 0.008 cm^{-1} for CuK_α radiation. The mass absorption coefficient of carbon (μ_l/ρ) is 4.301 ± 0.009 cm^2/g. This value is compared to other published results. (auth)

4885

MILNE'S PROBLEM WITH AN ARBITRARY INDICATRIX. M. V. Maslennikov (V. A. Steklov Mathematics Inst., Academy of Sciences, USSR). Soviet Phys. (Doklady) 3, 48-51(1958) Jan.-Feb.

An analysis is presented of Milne's problem on the propagation of radiation through a plane parallel scattering and absorbing medium filling semi-infinite three-space $z > 0$. (J.S.R.)

4886

MASS EXCHANGE IN CONDENSERS WITH HORIZONTAL TUBES WHEN THE STEAM CONTAINS AIR. L. D. Berman and S. N. Fuks. Teploenergetika No. 8, 66-74 (1958).

A series of tests was made on the condensation of steam in the presence of air in condensers with horizontal tubes. The equipment and techniques used are described. The pressure of the steam–air mixture was varied from 0.047 to 0.91 atm. The results are given and discussed in detail. It was concluded that the mass transfer coefficient during condensation depends on the air content of the mixture and on the Reynolds and Prandtl numbers. With increasing gas content, the coefficient rises rapidly and approaches infinity as the conditions for condensation of pure steam are approached. (TCO-J.S.R.)

4887

ON THE RADIAL DISTRIBUTION OF CHARGED PARTICLE CONCENTRATIONS IN A MAGNETIC ION SOURCE. M. D. Gabovich and Yu. B. Ermolovich (Inst. of Physics, Academy of Sciences, Ukrainian SSR). Ukrain. Fiz. Zhur. 2, 165-74(1957) Apr.-May. (In Ukrainian)

Results of some experiments on a magnetic ion source show that the increase of magnetic field is accompanied by the appearance of a main discharge column, the radius of which approaches the cathode radius. This column is a plasma pierced by the fast primary electrons. The law of the radial discharge distribution inside the column differs from that outside the column if the magnetic field is large enough. An equation is obtained for radial distribution of the charged particle concentration, based on the assumption that ionization is produced mainly by the fast primary electrons. Neutralization of the positive space charge takes place chiefly because of the slow electrons. The electrons generated in the column leave it because the radial diffusion is weakened by the magnetic field influence. The ions produced in the column leave it

chiefly along the potential groove to the ends of the vessel. (auth)

4888

PHOTOSENSITIVITY OF SINGLE CdS CRYSTAL IN SELF-ABSORPTION RANGE. V. E. Lashkarev, E. A. Sal'kov, et al. (Inst. of Physics, Academy of Sciences, Ukrainian SSR). Ukrain. Fiz. Zhur. 2, 261-73(1957) Sept.-Oct. (In Russian)

The spectral dependences of photocurrent, photocurrent efficiency, mobility and lifetime of photocarriers, and the reflection and transmission coefficients of a single CdS crystal were studied. The carrier mobility in the 4000 to 5200 A range was shown to be independent of the wavelength of the exciting light. The reflection coefficient in the self-absorption range does not exceed 20%. (tr-auth)

4889

THEORY OF FERMI LIQUID. PROPERTIES OF LIQUID He^3 AT LOW TEMPERATURES. A. A. Abrikosov and I. M. Khalatnikov. Uspekhi Fiz. Nauk 66, 177-212(1958) Oct. (In Russian)

The application of the Fermi-liquid theory to an isotopic model is analyzed, and it is shown that the L. D. Landau theory (Zhur. Eksptl'. i Teoret. Fiz. 30, 1058(1956)) can be used for explaining various properties of liquid He^3. A supplement is included describing recent work performed by Landau on microscopic studies of Fermi-liquid interactions and on the theory of Fermi-gas rarefaction, in which the basic Fermi-liquid magnitudes are calculated. (R.V.J.)

4890

THE CURRENT STATE OF NUCLEAR CHEMISTRY. A. K. Lavrukhina. Uspekhi Khim. 27, No. 5, 517-50 (1958) May. (In Russian)

After a short review of the history of the subject, the main subjects of review are: methods of nuclear chemistry; nuclear reactions produced by slow particles (neutron-induced reactions, charged-particle-induced reactions, slow neutron fission of heavy nuclei); (fast protons, deuterons, α particles, and neutrons); typical features of spallation; typical features of fission at high energies; emission of light nuclei; secondary reactions; reactions caused by heavy ions; γ-ray-induced reactions; π-meson-induced reactions; production of new particles; and nuclear reactions in nature. (tr-auth)

4891

ELECTRON CATALYSIS THEORY IN SEMICONDUCTORS. F. F. Vol'kenshtein. Uspekhi Khim. 27, 1304-20(1958) Nov. (In Russian)

General data are given on the electron catalysis theory of semiconductors. Various types of chemical sorption, catalytic activity, and adsorptive properties of semiconductors and the relation between surface and volume chemisorption are discussed. Effects of various factors on the catalytic activity and adsorption properties are analyzed. (R.V.J.)

4892

ABSORPTION AND POTENTIAL CHANGE OF NEGATIVE CHLORINE AND BROMINE IONS IN PASSAGE THROUGH GASES. O. Rosenbaum (Physikalischen Staatsinstitut, Hamburg). Z. Naturforsch. 13a, 842-6 (1958) Oct. (In German)

Experiments are described in which negative halogen ions must pass through a gas gap in a mass spectrographic arrangement. From the intensity weakening of the ion radiation, the absorption cross section can be derived. The observation of corresponding ions produces the change-in-potential cross section. The energy dependence of the effective cross section leads to a clarification of the question, "which ion annihilation processes are effective." On the basis of the Massey theory of adiabatic collisions, the values found were made plausible. (tr-auth)

4893

EXPERIMENTAL INVESTIGATION OF THE MAGNETIC RESISTANCE CHANGE IN CORBINO DISKS OF COPPER AND GOLD AT LOW TEMPERATURES. Günter Lautz and Eberhard Tittes (Technische Hochschule, Braunschweig, Ger.). Z. Naturforsch. 13a, 866-74 (1958) Oct. (In German)

According to the standard theory of Justi and Kohler, the 1, 3, 5, and 7 valent metals in an increasing magnetic field attain a finite saturation value for the resistance. On the other hand the 2, 4, 6, and 8 valent conductors could become insulators for $H \rightarrow \infty$. The reason for the appearance of the saturation values in the first group is the conductivity increase effect of the transverse Hall field. This effect disappears in the second group on account of the compensation of electron and defective electron conduction. The experimental confirmation for the validity of this theoretical consideration is given. It is shown that the magnetic resistance change of the single valent metals Cu and Au contains a supplementary term increasing quadratically with the magnetic field, when the investigation is made on cylindrical symmetrical Corbino disks instead of on the usual rods or strips. The Hall effect is zero because of the symmetry. The true magnetic resistance change, independent of the boundary effect, assumes exceptionally large values in odd valent metals also for $H \rightarrow \infty$. A quantitative comparison of the results on strips and disks in the temperature range from 10 to 78°K leads, with the Kohler theory, to an indirect determination of the Hall constant, whose value is in good agreement with the usual Hall effect measurements. Because of the temperature dependence observed at low temperature, the Hall constant in the investigation with the Corbino disks showed deviations from the Kohler rule for the magnetic resistance change of the metals, which was discussed in detail. (tr-auth)

4894

STRUCTURES OF BISMUTH OXIDES FORMED BY HEATING BISMUTH FILM IN AIR. P. S. Aggarwal and A. Goswami (National Chemical Lab., Poona, India). Z. Naturforsch. 13a, 885-7(1958) Oct.

Two new forms of bismuth oxide (a_0 = 5.65 and 7.02 A) were observed during the oxidation of bismuth films. The well-known tetragonal variety (a_0 = 10.93 A and c_0 = 5.65 A) seems to be a superstructure form of oxide. (auth)

4895

EFFECTIVE CROSS SECTIONS FOR CAPTURE OF SLOW ELECTRONS BY SOME HALOGEN-CONTAINING MOLECULES AND BY O_2 AND H_2O MOLECULES. I. S. Buchelnikova (Inst. of Chemical Physics, Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 35, 1119-30(1958) Nov. (In Russian)

The effective cross sections for capture of slow electrons by the molecules SF_6, CCl_4, CF_3I, CCl_2F_2, BCl_3, HCl, and HBr and the cross sections for capture of electrons of several ev energy by O_2 and H_2O molecules are measured by the single collision method with application of quasimonochromatic electrons. The width

of the electron energy distribution was 0.2 to 0.3 ev, the energy scale being given with an accuracy of about 0.01 to 0.02 ev. The following peak capture cross sections were obtained: SF_6, 5.7×10^{-16} cm^2; CCl_4, 1.3×10^{-16} cm^2; CF_3I, 17.8×10^{-17} cm^2; CCl_2F_2, 5.4×10^{-17} cm^2; BCl_3, 2.8×10^{-17} cm^2; HBr, 5.8×10^{-17} cm^2; HCl, 3.9×10^{-18}; H_2O, 4.8×10^{-18} cm^2; O_2, 1.3×10^{-18}. The potential of appearance of the O^- ion from O_2 was found to equal 4.63 ± 0.04 ev and of the H^- ion from H_2O, 5.45×0.09. ev. (tr-auth)

4896

ON THE KINETIC EQUATIONS FOR A SYSTEM OF PARTICLES INTERACTING WITH LATTICE OSCILLATIONS. Yu. L. Klimontovich and S. V. Temko (Moscow State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 35, 1141-5(1958). Nov. (In Russian)

A deduction of the kinetic equations for the distribution functions of electrons and crystal lattice oscillations is presented. In the case of homogeneous space the equation for the electron distribution function is identical with the kinetic equation in Bloch's electric conductivity theory. An equation for the lattice oscillations was derived, and expressions for the frequency and damping decrement of the oscillations were found. (tr-auth)

4897

LOW FREQUENCY PLASMA OSCILLATIONS IN A MAGNETIC FIELD. K. N. Stepanov (Inst. of Physics and Tech., Academy of Sciences, Ukranian SSR). Zhur. Eksptl'. i Teoret. Fiz. 35, 1155-60(1958) Nov. (In Russian)

Low-frequency electron-ion longitudinal oscillations in a plasma located in a magnetic field are considered. (tr-auth)

4898

ENERGY LOSSES OF ELECTRONS IN MEDIA WITH SPATIAL DISPERSION. V. M. Agranovich and A. A. Rukhadze. Zhur. Eksptl'. i Teoret. Fiz. 35, 1171-4(1958) Nov. (In Russian)

A general formula was obtained for the energy losses of an electron moving in an arbitrary anisotropic medium with space dispersion. It is shown in the nonrelativistic case that the total energy losses in an anisotropic medium do not vary if space dispersion of the medium is taken into account, whereas losses on excitation of transverse wave in general may change. If space dispersion of the medium is taken into account, Cherenkov radiation of frequency ω is distributed over the surfaces of several cones. The intensity of the radiation is calculated. (tr-auth)

4899

ON THE INTERACTION BETWEEN SMALL PERTURBATIONS AND THE DISCONTINUITIES IN MAGNETOHYDRODYNAMICS AND THE STABILITY OF SHOCK WAVES. V. M. Kontorvich (Inst. of Radiophysics and Electronics, Academy of Sciences, Ukrainian SSR). Zhur. Eksptl'. i Teoret. Fiz. 35, 1216-25(1958) Nov. (In Russian)

A simple geometrical method is presented for the construction of waves diverging (reflected and refracted) from a discontinuity surface and produced by the incidence of a plane monochromatic wave on a plane stationary discontinuity surface in a medium describable by equations of magnetohydrodynamics. The case of a shock wave is considered. The stability of shock waves with respect to inclined incident perturbations is investigated on basis of the results obtained. Variation of the frequency as a result of interaction of small perturbations with shock waves is considered. (tr-auth)

4900

POLARIZATION OF INTERNAL CONVERSION ELECTRONS EMITTED AFTER β-DECAY. B. V. Geshkenbein. Zhur. Eksptl'. i Teoret. Fiz. 35, 1235-42(1958) Nov. (In Russian)

The correlation between the polarization of conversion electrons and the direction of electron emission in the preceding β decay is considered. The calculation is conducted with account of the nuclear electric field. Conversion can occur in any of the shells. In particular for electrons converted in the K shell, the nuclear electric field exerts a considerable effect leading to the appearance of an appreciable transverse polarization component in magnetic transitions and to a significant increase of the polarization in electric transitions. (tr-auth)

4901

OSCILLATIONS OF A DEGENERATE ELECTRON FLUID. V. P. Silin (Lebedev Inst. of Physics, Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 35, 1243-50(1958) Nov. (In Russian)

Oscillations of an electron fluid are considered on basis of Landau's theory of Fermi fluids. The oscillations reduce to longitudinal plasma waves, transverse electromagnetic waves, zero sound, and spin waves. (tr-auth)

4902

ON THE POSSIBLE STATISTICAL DESCRIPTION OF A PARTICLE SYSTEM INTERACTING WITH A FIELD. Yu. L. Klimontovich (Moscow State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 35, 1276-7(1958) Nov. (In Russian)

The kinetic equations for electron systems and for oscillators in transverse electromagnetic fields are analyzed in relation to studies of charged particle emission by electromagnetic waves in dielectrics and slowing-down media. It was assumed that the electron charge is compensated by a uniformly smeared-out positively charged background. (R.V.J.)

4903

SCATTERING OF PARTICLES WITH SPIN 2 IN COULOMB FIELDS. A. I. Bedritskii (Vitebsk Pedogogical Inst.). Zhur. Eksptl'. i Teoret. Fiz. 35, 1278-80(1958) Nov. (In Russian)

The effective cross section for heavy Coulomb center elastic scattering of particles with spin 2 was determined by its analogy to the electron theory, as developed by A. A. Tokolov et al. (Quantum Field Theory, Moscow, 1952). (R.V.J.)

4904

HYDRODYNAMIC STUDIES OF RAREFIED PLASMA CONSTRICTION IN AXIALLY-SYMMETRIC MAGNETIC FIELD. Yu. N. Barabanenkov (Moscow State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 35, 1280-1(1958) Nov. (In Russian)

Completely ionized plasma without impingement, confined by a narrow magnetic field, is investigated. (R.V.J.)

4905

RADIATION EMISSION OF CHARGED PARTICLES IN FLIGHT THROUGH A PLATE. G. M. Garibyan and G. A. Chalikyan (Inst. of Physics, Academy of Sciences, Armenian SSR). Zhur. Eksptl'. i Teoret. Fiz. 35, 1282-3(1958) Nov. (In Russian)

The motion of a charged particle in flight through a

plate along the positive direction of the z axis, with dielectric constant ϵ and thickness a, is analyzed. The assumption is made that in the region $z < 0$ the radiation field consists only of the reflected waves, and in the region $z < a$ the waves are moving in a positive direction along the z axis, while both types of waves are present in the plate. (R.V.J.)

4906

DISPERSIONS IN SMALL RUPTURES IN MAGNETIC HYDRODYNAMICS. G. Ya. Lyubarskii and R. V. Polovin (Inst. of Physics and Tech., Academy of Sciences, Ukrainian SSR). Zhur. Eksptl'. i Teoret. Fiz. 35, 1291-3(1958) Nov. (In Russian)

The amplitudes in hydromagnetic waves in initial dispersion capture, where three of the waves are in motion to the right while three other waves are moving to the left and one remains stationary, are analyzed. In the instance analyzed the initial rupture is quite weak, hence the secondary ones are also weak. The ratio between the magnetohydrodynamic magnitude drops in the auto model and impact waves (with weak intensities) is similar to that between the amplitudes in the corresponding linear waves. (R.V.J.)

4907

OBSERVATION OF A Λ-TRANSITION IN HELIUM FOR A HEAT FLOW THROUGH A PHASE BOUNDARY. V. P. Peshkov. Zhur. Eksptl'. i Teoret. Fiz. 35, 1350-4(1958) Dec. (In Russian)

Experiments on the observation of a density and temperature discontinuity on the boundary between superfluid and nonsuperfluid helium in the presence of a heat flow are described. The reasons of stability of the boundary are explained, and some examples of violation of stability at large densities of the heat flow are presented. (tr-auth)

4908

COMPARISON OF DEIONIZATION RATES IN HYDROGEN AND DEUTERIUM PLASMA. G. I. Glotova, V. L. Granovskii, and V. I. Savoskin (All-Union Electrotechnical Inst., Moscow). Zhur. Eksptl'. i Teoret. Fiz. 35, 1380-5(1958) Dec. (In Russian)

The deionization rate in hydrogen and deuterium at pressures p = 15 to 600 μ Hg, tube diameters d = 3.2 to 6.5 cm, and values of the preceding current of I_0 = 60 to 1500 ma was studied by oscillography of the ion current recorded with a negative probe. Under the conditions employed, the relative deionization rate in H and D decreased with time. The pressure dependence of the rate of the process is not a straight-line function and passes through a maximum at $pd \sim 10^{-1}$ to 1 mm Hg. The ratio of the deionization time constants (initial as well as final) in deuterium and hydrogen, τ_D/τ_H, is close to 1.4, i.e., $\approx \sqrt{m_D/m_H}$ for all pressures under diffusion conditions ($p < p_m$) as well as under recombination conditions ($p > p_m$). The latter signifies that under these conditions volume recombination mainly occurs in triple collisions with neutral molecules ($m^+ + e + M$). (tr-auth)

4909

PHYSICAL PHENOMENA OBSERVED DURING THE EXPANSION IN VACUUM OF BODIES COMPRESSED BY STRONG SHOCK WAVES. Ya. B. Zeldovich and Yu. P. Raizer. Zhur. Eksptl'. i Teoret. Fiz. 35, 1402-6(1958) Dec. (In Russian)

The glow of an opaque, initially solid body appearing after compression by a strong shock wave with subsequent expansion in vacuum is studied. Condensation of vapor of the substance and recombination of ions and electrons under these conditions are also considered. (tr-auth)

4910

ON THE INTERACTION BETWEEN A MEDIUM AND A RING CURRENT INCIDENT ON IT. V. N. Tsytovich (Moscow State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 35, 1407-16(1958) Dec. (In Russian)

The spectral distributions of the current in a ring which impinges with a constant relativistic velocity on a medium possessing arbitrary $\epsilon(\omega)$ and μ are analyzed. The reflection criterion for nonrelativistic velocities and expressions for the acting forces are deduced. (tr-auth)

4911

ON THE STATISTICS OF SPIN AND POLAR EXCITATIONS IN CRYSTALS. S. V. Vonsovskii and M. S. Svirskii (Inst. of Metal Physics, Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 35, 1447-56(1958) Dec. (In Russian)

The question regarding the type of statistics of quasiparticles (the elementary excitations of the spin and electron systems of a crystal) is discussed. (tr-auth)

4912

ON THE STABILITY OF SHOCK WAVES IN MAGNETOHYDRODYNAMICS. S. I. Syrovtskii (Lebedev Inst. of Physics, Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 35, 1457-70(1958) Dec. (In Russian)

The interaction between shock waves in a magnetic field and magnetohydrodynamic waves of small amplitude are considered. The condition for stability with respect to spontaneous emission of weak magnetohydrodynamical waves by a shock wave were obtained. Conditions under which the linear equations for a small perturbation do not have a solution were found, this case being interpreted as a disintegration of a shock wave. (tr-auth)

4913

INFLUENCE OF ELECTRON PARAMAGNETIC EFFECT ON THE FARADAY OPTICAL EFFECT AT LOW TEMPERATURES. G. V. Skrotskii, P. S. Zyryanov, and T. G. Izyumova. Zhur. Eksptl'. i Teoret. Fiz. 35, 1471-4(1958) Dec. (In Russian)

An expression was found for the angle of rotation of the light wave polarization plane in a sample located in constant and radiofrequency magnetic fields in the neighborhood of paramagnetic resonance. A comparison is made with the experimental data. (tr-auth)

4914

SURFACE VIBRATIONS OF A CHARGED COLUMN IN A LONGITUDINAL MAGNETIC FIELD. Chao Kai-hua (Moscow State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 35, 1475-80(1958) Dec. (In Russian)

The problem of surface vibrations and stability of a hydrodynamic charged column located in an external magnetic field is considered. The investigation is an extension of the well known work of Kruskal–Schwarzchild and Taylor on the stability of an uncharged hydrodynamic column. A dispersion equation for surface waves is found, and various consequences relating to the vibration spectrum are analyzed. From the experimental standpoint these results may be useful for elucidation of the nature of radiation from a plasma in a magnetic field, a problem which still awaits its final solution. (tr-auth)

4915

FERROMAGNETIC RESONANCE IN A CIRCULARLY POLARIZED ELECTROMAGNETIC FIELD OF ARBITRARY AMPLITUDE. G. V. Skrotskii and Yu. I. Alimov (Urals Polytechnic Inst.). Zhur. Eksptl'. i Teoret. Fiz. 35, 1481-4(1958) Dec. (In Russian)

The exact solutions of the magnetization equations of motion are analyzed. The dependence of the magnetization components on the amplitudes of the constant magnetizing and radiofrequency fields is determined. A comparison is made with the experimental results. (tr-auth)

4916

ELECTROMAGNETIC WAVES IN A CRYSTAL IN THE REGION OF EXCITON ABSORPTION. A. S. Davydov and A. F. Lubchenko. Zhur. Eksptl'. i Teoret. Fiz. 35, 1499-1507(1958) Dec. (In Russian)

A theory is developed which yields the absorption coefficient and refractive index in absorption bands corresponding to exciton excitations in molecular crystals at low temperatures. It is shown that the structure of the absorption band may be used to determine the sign of the effective exciton mass. Conditions are found which yield a zero refractive index at the short wave side of the excitation band. Electromagnetic waves of these frequencies are completely reflected from the surface of the crystal and enter it on a very small depth. This effect disappears with increase of the temperature. (tr-auth)

4917

ON THE MOTION OF A CHARGED PARTICLE IN AN ANISOTROPIC MEDIUM. G. A. Begiahvili and E. V. Gedalin (Tbilis State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 35, 1513-17(1958) Dec. (In Russian)

Expressions for the electromagnetic field components are derived and the total energy losses are determined for a charged particle moving in an anisotropic gyroelectric and gyromagnetic medium. (tr-auth)

4918

BOSON EXCITATIONS IN IONIC CRYSTALS. M. Sh. Giterman, P. S. Zyryanov, and H. H. Taluts (Urals State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 35, 1532-7 (1958) Dec. (In Russian)

In the second quantization representation a study is made of bose elementary excitations of a system of electrons (excitons) interacting with polarization vibrations of a crystal. In the case of weak coupling the interaction leads to a decrease of the exciton energy and to an increase of its effective mass. These effects are estimated quantitatively. (tr-auth)

4919

RADIO EMISSION IN AN ATOMIC EXPLOSION. A. S. Kompaneets (Inst. of Chemical Physics, Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 35, 1538-44(1958) Dec. (In Russian)

It is shown that in an atomic explosion in which gamma quanta are emitted asymmetrically, radio waves are emitted due to the presence of a current in the ionized air. The duration of the oscillations in each half wave is of the order of 10 μsec, and for equal asymmetry of gamma-ray emission the amplitude of the oscillations weakly depends on the total emission. (tr-auth)

4920

ON THE THEORY OF SUPERCONDUCTING ALLOYS. I. THE ELECTRODYNAMICS OF ALLOYS AT ABSOLUTE ZERO. A. A. Abrikosov and L. P. Gor'kov (Inst. of Problems in Physics, Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 35, 1558-71(1958) Dec. (In Russian)

A theory of superconductors containing impurities at zero temperature is presented. The dependence of the penetration depth on the impurity concentration is examined supposing the concentration to be small. The electrodynamic equations in alternating field were obtained for superconductors having the electron free path smaller than the correlation length. (tr-auth)

4921

WAVE SOLUTION FOR NON-LINEARLY GENERALIZED RELATIVISTICALLY INVARIANT EQUATIONS. D. F. Kurdgelaidze (Moscow State Univ). Zhur. Eksptl'. i Teoret. Fiz. 35, 1572-3(1958) Dec. (In Russian)

According to singular nonlinear field theory, all elementary particles are produced in a fundamental spinor field. However, since the spinor equation is considered nonlinear, the fields of other particles are also nonlinear. An exact wave solution method is applied to generalize relativistic invariant equations. (R.V.J.)

4922

NON-LINEAR INTERACTIONS OF RADIO WAVES PROPAGATING IN PLASMA. V. L. Ginzburg (Lebedev Inst. of Physics, Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 35, 1573-5(1958) Dec. (In Russian)

The nonlinear phenomenon of cross modulation (interactions of non-modulated radio waves) appearing in plasma and in the ionosphere was previously analyzed. Additional studies are made of the dependence of electron concentrations on radio wave fields in heterogeneous isotopic plasma and magneto-active homogeneous plasma. (R.V.J.)

4923

SOME NEW DATA ON THE NATURE OF PHOTOGRAPHIC SENSITIVITY TO IONIZING PARTICLES. A. L. Kartuzhanskii. Zhur. Nauch. i Priklad. Fot. i Kinematografii 3, No. 2, 81-7(1958) Apr. (In Russian)

The same number of Ag atoms (~10) must be freed to render a grain developable in both light- and charged-particle-sensitive emulsions. The grain surface centers responsible for either sensitivity are equally effective, no matter whether light or ionizing radiation is the operative agent. The F-center concentrations are always small in the crystals of high-sensitivity nuclear emulsions. High concentrations may lower the sensitivity. The differences between ordinary and nuclear emulsions are due to the different natures of the centers required. (tr-auth)

4924

VOLUME GRADIENT ELECTROMOTIVE FORCE IN PRESENCE OF CURRENT IN GERMANIUM. P. I. Baranskii and E. I. Komukharev (Inst. of Physics, Kiev). Zhur. Tekh. Fiz. 28, 1896-1904(1958) Sept. (In Russian)

It is shown that the emf E_p^* appears in germanium in the presence of a current. Correlations were made of E_p^* variation of p with the coördinate. The volume gradient in n and p type germanium has an opposite sign. The volume-gradient emf plays an important part in measurements of semiconductor electric characteristics by probe methods. (tr-auth)

4925

PHOTOELECTRON AND SECONDARY-ELECTRON EMISSION. P. G. Borzyak and O. G. Sarbei (Inst. of Physics, Kiev). Zhur. Tekh. Fiz. 28, 1905-12(1958) Sept. (In Russian)

The photoelectron emission of W–BaO and Ge–BaO cathodes in the visual spectrum was investigated and compared. (R.V.J.)

4926

NUCLEAR ENGINEERING HANDBOOK. First Edition. Harold Etherington, ed. New York, McGraw-Hill Book Company, Inc., 1958. 1872p.

This handbook is divided into fourteen major sections. These sections include: mathematical data and general tables; nuclear data; mathematics; nuclear physics; experimental techniques; reactor physics; radiation and radiological protection; control of reactors; fluid and heat flow; reactor materials; chemistry and chemical engineering; nuclear power plant selection; mechanical design and operation of reactors; and isotopes. (W.L.H.)

4927

OSNOVY TERMODINAMIKI I TEPLOPEREDACHI. (Principles of Thermodynamics and Heat Transfer.) Grigoriy Ivanovich Voronin. Moscow, Oborongiz, 1958. 342p.

The book is intended as a textbook for aviation technical schools for courses in thermodynamics and heat transfer. The laws of thermodynamics, gas and steam processes, the cycles of gas and steam engines, gas discharge, and heat transfer by conduction, convection, and radiation are discussed. (TCO-J.S.R.)

4928

TABLITSY TERMODINAMICHESKIKH FUNKTSIY VOZDUKHA DLYA TEMPERATUR OT 6000° DO 12000°K I DAVLENIY OT 0,001 DO 1000 ATMOSFER. (Tables of Thermodynamic Functions of Air for Temperatures of 6,000° to 12,000°K and Pressures of 0.001 to 1,000 Atmospheres.) Aleksandr Savvich Predvoditelev, Yevgeniy Vladimirovich Stupochenko, et al. Moscow, Izd-vo AN SSSR, 1957. 301p.

Tables are presented of the thermodynamic functions of air at temperatures from 6,000 to 12,000°K and pressures from 0.001 to 1,000 atm. (TCO-J.S.R.)

Elementary Particles

4929 INSJ-13

Tokyo Univ. Inst. for Nuclear Study.

ANALYSIS OF A HIGH ENERGY NUCLEAR INTERACTION IN EMULSION CHAMBER. S. Hasegawa. Nov. 1, 1958. 42p.

A high-energy event, believed to be a cosmic neutron or proton with a carbon nucleus, recently found during emulsion scanning is described. The half-angle and energy-balance methods were used in assigning an energy of 2×10^{14} ev to the interaction. Angular distributions of both charged secondaries and π^0 mesons, energies of π^0 mesons and their decay gammas, and the π^0 transverse mementum spectrum were obtained. These determinations are presented, discussed, and compared with values reported for other events in the high-energy range. (D.E.B.)

4930 NP-7106

Polish Academy of Sciences. Inst. of Nuclear Research, Warsaw.

A NOTE ON ENERGY AND ANISOTROPY ESTIMATION IN HIGH-ENERGY JETS. Report No. 41/VI. P. Zielinski. Nov. 1958. 6p.

For the estimation of energy in high-energy nucleon-nucleon jets the formula proposed by Castagnoli et al. is commonly used. The degree of anisotropy in the angular distribution of secondary particles can be characterized by adjusting the coefficient in the assumed distribution to the observed distribution. The limits of error of energy and anisotropy estimates are discussed. The statistical test of Kolmogorov and Smirnov is used. (W.D.M.)

4931

ANTINUCLEONS. Emilio Segrè (Univ. of California, Berkeley). Ann. Rev. Nuclear Sci. 8, 127-62(1958).

Only fermions of spin $\frac{1}{2}$ are considered, and a set of properties is given which relates a particle and its "charge conjugate." Verification of Dirac's attributes of the antiproton is discussed. The nucleonic properties of the antiproton are reviewed. Some cosmological speculations on antimatter are given. (W.D.M.)

4932

A STUDY OF μ-MESONS INCIDENT AT LARGE ZENITH ANGLES. B. G. Wilson (National Research Council, Ottawa). Can. J. Phys. 37, 19-29(1959) Jan.

A Geiger counter telescope was employed to study μ mesons incident at large zenith angles. The counters were hodoscoped in pairs enabling the direction and angle of incidence of the particles to be determined. The intensity was analyzed as a function of arrival time, but no significant variation was found either in solar time or sidereal time. However, a variation in solar time noted on analysis of extensive air showers measured concurrently. The angular variation of intensity was studied and absolute rates obtained; these rates were compared with those of an earlier determination showing excellent agreement. Some evidence was obtained of a directional anisotropy in the μ-meson flux as measured at the apparatus. (auth)

4933

LOW ENERGY PROTON FLUX AT SEA LEVEL. I. B. McDiarmid (National Research Council, Ottawa). Can. J. Phys. 37, 79-81(1959) Jan.

The vertical proton flux in the momentum interval 716 to 828 Mev/c at latitude 57°N and average atmospheric pressure 1002 mb was measured. The experiment was relatively free from uncertainties in the identification of protons and had the advantage of a rather small acceptance angle. A cloud chamber was used containing two plastic scintillators and nine aluminum plates. Proton stopping in one of the plates in the chamber was nearly 100% efficient, but μ-meson stopping efficiency was only 6%. The apparatus operated 1500 hours from March to June, 1958, during which time 270 particles were observed to stop in the bottom scintillator and 504 in the aluminum plates. The results of the experiment are graphically shown. (A.C.)

4934

SCATTERING OF LONGITUDINALLY POLARIZED ELECTRONS AND POSITRONS ON POLARIZED ELECTRONS. A. I. Mukhtarov and Yu. S. Perov (Kirov Azerbaidzhan State Univ.). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 883-5(1958) July. (In Russian)

General expressions were evolved for effective cross sections containing the final spin magnitude along with the magnitude of the initial spin for both particles. The polarization of particles after scattering was also de-

termined. Studies were made only of the particles with spin projection in the direction of the motion (the longitudinally polarized particles). (R.V.J.)

4935

BREMSSTRAHLUNG OF LONGITUDINALLY POLARIZED ELECTRON. B. K. Kerimov and I. M. Nadzhafov (Lomonosov Moscow State Univ.). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 886-92(1958) July. (In Russian)

A formula was developed for determining the degree of dependence of bremsstrahlung spheroidal polarization on angle and energy. The formula developed for the effective cross section of bremsstrahlung is a generalization of the Bethe-Heitler formula with account for the longitudinal polarization of the electron and positron spin. (R.V.J.)

4936

THE SCATTERING OF A PARTICLE BY A COMPLEX BOUND SYSTEM. J. Yvon (Centre d'Etudes Nucleaires, Saclay, France). Nuclear Phys. 5, 150-66(1958). (In French)

In the calculation of coherent scattering, the perturbation method is replaced by the search for an equation of propagation which would allow the progress of the diffusion to be followed from point to point. The method consists, after the traditional perturbation calculation, in eliminating the incident radiation by expressing it as a function of the scattered coherent radiation. In the case of a system originally in a well defined quantum state, the coherent wave is propagated according to an optical type equation. In the case of a system in thermodynamic equilibrium, this property also belongs to the optical wave, which is a certain average of the elementary coherent waves. An analogous method, when applied to the mixture which represents the over-all scattering, allows the origin and propagation of this scattering to be followed at the same time. In the case of light scattering, more detailed deductions relative to Rayleigh scattering may be expected—intensity and fine structure. Considered from a more general viewpoint, the theory proposed is a theory of the Brownian motion of a microscopic particle. The fundamental equation which summarizes this theory is a generalized form of the Boltzmann equation. (auth)

4937

ON THE COLLECTIVE PROPERTIES OF A BOSON SYSTEM. J. G. Valatin and D. Butler (Univ. of Birmingham, Eng.). Nuovo cimento (10) 10, 37-54(1958) Oct. 1.

A method in close correspondence with the theory of superconductivity of Bardeen, Cooper, and Schrieffer is applied to a boson system, extending an earlier approach by Bogolubov. Minimizing the energy with respect to a trial ground state vector of exponential form, new equations and expressions are derived for the excitation spectrum of bosons. The expressions are in a one to one correspondence with those for fermions, from which formally they differ only through signs. The physical content of the expression is, however, very different. Equations with a predominantly repulsive interaction which in the fermion case have no collective solutions lead to such solutions for bosons because of a partial Bose-Einstein condensation. It is pointed out that the method is related to a linearization of the quantized matter field equations. Temperature dependent equations are obtained by the same methods as in the theory of superconductivity. The λ point is defined by the disappearance of the partial Bose-Einstein condensation. (auth)

4938

DISPERSION RELATION FOR POTENTIAL SCATTERING. S. Gasiorowicz (Univ. of Copenhagen) and H. P. Noyes (Univ. of Liverpool and Univ. of California, Livermore). Nuovo cimento (10) 10, 78-89(1958) Oct. 1.

A dispersion relation for the scattering of a Klein-Gordon particle by a fixed static interaction is derived. The dispersion relation is valid only for momentum transfers less than a given limit determined by the behavior of the interaction at large distances. The dependence of this limit on the mass spectrum is discussed, and it is found that if the system admits sufficiently exothermic inelastic processes, the derivation fails even in the case of forward scattering. (auth)

4939

ON A COMPOUND MODEL OF THE PION-HYPERON INTERACTIONS. D. B. Lichtenberg (Univ. of Hamburg) and M. Ross (Indiana Univ., Bloomington). Nuovo cimento (10) 10, 104-10(1958) Oct. 1.

Pion-hyperon interactions are considered in the light of a compound model in which a hyperon is taken to be a system of a nucleon plus a meson whose only role is to give the hyperon its observed symmetry properties. It is assumed that pions interact with the nucleon in a hyperon as if the nucleon were free and that pions do not interact appreciably with the new meson. The pion interactions with the Λ and Σ which follow from this model are equivalent to the interactions of the elementary particle theory of Gell-Mann. The pion interactions with the Ξ are not unique without a further restriction on the model. As an example of this nonuniqueness, two different Ξ-N potentials are obtained, one of which is approximately the same as the ordinary nucleon-nucleon potential, while the other is much weaker at large distances. (auth)

4940

LIFETIME OF Λ^0, θ^0, AND Σ^-. F. Eisler (Columbia Univ., New York and Brookhaven National Lab., Upton, N. Y.); P. Bassi (Univ. of Bologna); and M. Conversi (Univ. of Pisa, Italy). Nuovo cimento (10) 10, 150-4 (1958) Oct. 1.

The lifetimes of the Λ^0, θ^0, and Σ^- observed in bubble chamber photographs were calculated. The following values are obtained: $\tau_{\Lambda^0} = (2.29^{+0.15}_{-0.13}) \times 10^{-10}$ s on the basis of 454 events; $\tau_{\theta^0} = (1.06^{+0.08}_{-0.06}) \times 10^{-10}$ s on the basis of 259 events; and $\tau_{\Sigma^-} = (1.89^{+0.33}_{-0.25}) \times 10^{-10}$ s on the basis of 107 events. A comparison with previous values of the mean lives is presented. (auth)

4941

ON THE SCATTERING OF (200 TO 300) Mev K^+-MESONS. D. Evans (Univ. of Bristol, Eng.) and E. Helmy (Univ. of California, Los Angeles). Nuovo cimento (10) 10, 168-74(1958) Oct. 1.

Earlier work on the scattering of K^+ mesons of energies from 40 to 200 Mev in nuclear emulsions has shown that the scattering is mainly due to the T = 1 isotopic spin state, and it is primarily an s-state interaction. The contribution of T = 0 is small and, to account for the backward peaking of the K^+-nucleon differential cross section, is usually considered to be p-wave. Preliminary results have now been obtained at energies from 200 to 300 Mev, and the nature of the scattering appears to have changed considerably. The results of the experimental work are graphically shown. (A.C.)

4942

AN INVESTIGATION OF ANGULAR CORRELATIONS IN THE DECAY OF CHARGED HYPERONS. W. Alles (Univ. of Bologna); H. Göing (Max-Planck-Institut für Physik, Göttingen, Ger.); J. Crussard (École Polytechnique, Paris); and G. Dascola (Univ. of Parma, Italy). Nuovo cimento (10) 10, 175-6(1958) Oct. 1.

A previous study of a collection of emulsion data on possible asymmetries in Σ^- hyperon decay indicated that asymmetries could exist in the angular distribution of decay products. The present study of K^- interactions by means of four new stacks, exposed to the Heckman K^- beam of the Bevatron, shows a considerable number of events. They were selected and analyzed in the same way as in the previous study. The results are tabulated. According to the data, it seems that if asymmetries exist they are smaller than in the previous compilation. (A.C.)

4943

K^--NUCLEON SCATTERING WITH TAMM-DANKOFF APPROXIMATION. C. Ceolin, N. Dallaporta, and L. Taffara (Univ. of Padua and Istituto Nazionale di Fisica Nucleare, Padua). Nuovo cimento (10) 10, 186-9 (1958) Oct. 1.

The investigators have tried to develop, in a more systematic way, the solution of the complete Tamm-Dankoff equations for K^--nucleon pseudoscalar interactions which connect the K^--nucleon state with the Σ-π and Λ-π states. The solution is based on an initial separation of the different isotopic spin states. The equation is numerically solved, and the results obtained are discussed. (A.C.)

4944

HIGH-ENERGY ELECTRON SCATTERING FROM NUCLEI WITH FINITE CHARGE DISTRIBUTIONS. H. S. Valk (Univ. of Oregon, Eugene). Nuovo cimento (10) 10, 200-4(1958) Oct. 16.

By applying a relativistic extension of Molière's formula for the electron scattered amplitude to the particular case of potentials generated by radial charge distributions of finite extent, it is shown that the amplitude can be resolved into three distinct contributions: (1) the Mott point-charge scattered amplitude; (2) a correction to this arising from the finite radial cut-off; and (3) a term characteristic of the charge distribution. The resulting expression is applied to the case of a uniform charge distribution for which an optical analogy is indicated. (auth)

4945

ANALYSIS OF INELASTIC INTERACTIONS OF K^+-MESONS WITH EMULSION NUCLEI (40 to 150 Mev). M. Grilli, L. Guerriero, et al. (Univ. of Padua and Istituto Nazionale di Fisica Nucleare, Padua). Nuovo cimento (10) 10, 205-27(1958) Oct. 16.

212.5 m of K^+ track in the energy interval from 40 to 150 Mev were followed. The events found were classified as follows: (1) 8 K-H interactions; (2) 184 inelastic scatterings; and (3) 23 charge exchange. All these events were divided into four energy intervals. Data on the K^+-nucleus and K^+-nucleon inelastic interactions are given. For the K^+-nucleus interactions are given: the variation of the total cross section with the primary energy; the angular and energy loss distributions and their correlation; and further support for a nuclear repulsive potential. Starting from the inelastic events, an analysis was made to find the elementary K-nucleon cross sections. The procedure followed is summarized. Particular care was taken to ensure that the separation between elastic and inelastic events would not alter the essential results. The total and angular K-free nucleon and K-free neutron cross sections (for scattering as well as for charge exchange) were then deduced with this analysis. Values for elementary cross-sections were compared with those previously published. Finally, the scattering amplitudes and the relative weight of the T = 1 and T = 0 states were evaluated. (auth)

4946

A NOTE ON THE APPARENT INCONSISTENCY AMONG MEASUREMENTS OF THRESHOLD PION INTERACTIONS. M. Cini, R. Gatto, et al. (Univ. of Rome and Istituto Nazionale di Fisica Nucleare, Rome). Nuovo cimento (10) 10, 243-58(1958) Oct. 16.

The apparent inconsistency among threshold pion interactions is resolved by the use of extrapolation procedures for charge exchange and photoproduction amplitudes more in accord with theory than conventional linear extrapolations. (auth)

4947

ON THE PROOF OF THE ABSENCE OF RENORMALIZATION OF THE CONSTANT IN THE VECTOR-VARIANT OF β-INTERACTION. B. L. Ioffe (Academy of Sciences, Moscow). Nuovo cimento (10) 10, 352-4 (1958) Oct. 16.

It is proved that the vector coupling constant suffers no renormalization if the β-decay Hamiltonian of Feynman and Gell-Mann is followed. (auth)

4948

DIRAC AND GÜRSEY EQUATIONS FOR BOSONS. J. Fiutak (Nicholas Copernicus Univ., Toruń, Poland). Nuovo cimento (10) 10, 292-9(1958) Oct. 16.

A possibility of writing the field equations in a new algebraic form is illustrated. The wave equations for bosons were obtained in terms of 16-dimensional Clifford algebra C_4, and alternatively, in connection with the Gürsey formalism, in terms of the 4-dimensional Clifford algebra C_2. (auth)

4949

ON $\pi \rightarrow e + \nu + \gamma$ DECAY. V. G. Vaks and B. L. Ioffe (Academy of Sciences, Moscow). Nuovo cimento (10) 10, 342-51(1958) Oct. 16.

The $\pi \rightarrow e + \nu + \gamma$ decay is considered for the case of vector and axial-vector interaction. The assumption that in the vector-variant there is a direct interaction of π mesons with an electron-neutrino field as proposed by Gell-Mann and Feynman presents the possibility of establishing an exact relation between the probability of $\pi \rightarrow e + \nu + \gamma$ decay through the vector-variant and the probability of $\pi^0 \rightarrow 2\gamma$ decay. As a result, it appears that in the total probability of $\pi \rightarrow e + \nu + \gamma$ decay the main role is played by decay through the axial variant, and the ratio of total probability of $\pi \rightarrow e + \nu + \gamma$ decay to the probability of $\pi \rightarrow \mu + \nu$ decay is of the order of 5×10^{-4}. Expressions for the angular and energy distribution of electrons and quanta were obtained. (auth)

4950

ON COROLLARIES FROM THE TWO-COMPONENT NATURE OF THE ELECTRON IN β-INTERACTIONS. B. L. Ioffe and V. A. Ljubimov (Academy of Sciences, Moscow). Nuovo cimento (10) 10, 355-8(1958) Oct. 16.

A necessary and sufficient condition for the value

v/c of the longitudinal polarization of the electron is discussed. (auth)

4951

ON THE POLARIZATION OF ELECTRONS FROM THE DECAY OF MUONS. L. B. Okun and V. M. Šehter (Academy of Sciences, Moscow). Nuovo cimento (10) 10, 359-64(1958) Oct. 16.

An expression for the energy spectrum, angular distribution, and polarization of electrons emitted by decaying muons was obtained. The calculations are carried out for a decay interaction Hamiltonian of the most general form characterized by ten complex constants. It is shown that experiments performed up to the present time are not sufficient for the verification of the predictions made. (auth)

4952

POLARIZATION OF ELECTRONS OF INTEGRAL CONVERSION FOLLOWING THE β-DECAY TAKING INTO ACCOUNT THE ELECTRIC FIELD OF THE NUCLEUS. B. V. Geškenbein (Academy of Sciences, Moscow). Nuovo cimento (10) 10, 365-74(1958) Oct. 16.

The correlation of the polarization of conversion electrons with the direction of emission of electrons preceding β decay was considered. In the entire computation the electric field of the nucleus was taken into account. Computation of the electric field of the nucleus results in the appearance in magnetic transitions of a considerable transverse component of polarization, while in the electrical transitions the magnitude of polarization is increased substantially. (auth)

4953

POLARIZATION OF THE INTERNAL CONVERSION ELECTRONS ACCOMPANYING β-DECAY. V. B. Beresteckij and A. P. Rudik (Academy of Sciences, Moscow). Nuovo cimento (10) 10, 375-82(1958) Oct. 16.

The correlation of the polarization of the conversion electrons and the velocity of the electrons emitted in a previous allowed β-decay transition is considered. In the magnetic multipole case the polarization is longitudinal and energy independent if the influence of the nuclear Coulomb field is neglected. In the electric multipole case longitudinal as well as transversal polarization exist, both depending on the electron energy. (auth)

4954

ON β-TRANSITIONS 0−0 WITH CHANGE OF PARITY. B. V. Geškenbein (Academy of Sciences, Moscow). Nuovo cimento (10) 10, 383-4(1958) Oct. 16.

It is shown that the form of the spectrum and the polarization of the electrons in 0−0 β transitions is in agreement with a V-A type of interaction. (auth)

4955

RAPID DECREASE OF COSMIC RAY INTENSITY. J. F. Steljes and H. Carmichael (Chalk River Labs., Ontario, Can.). Nuovo cimento (10) 10, 393-4(1958) Oct. 16.

Two observers at Cambridge, Mass., using a very high rate meson monitor near sea level reported a small cosmic-ray decrease, beginning at 0100 UT on February 11, 1958, some 20 to 25 min before the sudden commencement of a magnetic storm, and lasting for about 1.75 hours. Readings obtained from each of two neutron monitors in the Deep River station, also near sea level, appear to confirm this change, although the counting rates are very much smaller. Both the meson and neutron counter data are given and discussed. A description is given of the neutron monitors, and possible advantages of monitoring cosmic radiation by neutron counting are considered. (A.C.)

4956

CHARGE INDEPENDENCE AND PION SCATTERING. A. Stanghellini (CERN, Geneva). Nuovo cimento (10) 10, 398-402(1958) Oct. 16.

Experimental investigation suggests that the charge independence hypothesis is valid. An attempt is made to give a quantitative basis to experimental results without passing through the phase-shift analysis. (A.C.)

4957

RADIATIVE CORRECTIONS TO THE $\pi \rightarrow e + \nu$ DECAY. H. W. Lewis (Los Alamos Scientific Lab., N. Mex.). Nuovo cimento (10) 10, 405-6(1958) Oct. 16.

Uncertainties in the application of electron self-energy and vertex corrections in meson decay considerations are indicated. (D.E.B.)

4958

QUANTUM NUMBERS FOR A SYSTEM OF NUCLEONS AND ANTINUCLEONS. A. Gamba and E. C. G. Sudarshan (Univ. of Rochester, N. Y.). Nuovo cimento (10) 10, 407-9(1958) Oct. 16.

In the general case it can be shown that there are no additive quantum numbers for the nucleon−antinucleon−pion system in addition to I, I_3, and K_3 which are strictly conserved (if one accepts the usual charge-independent PS(PS) or PS(PV) interaction). It is emphasized that even within the framework of charge-independent interactions, not all final states are necessarily equivalent, and the additional quantum numbers labeling these states may be sufficiently well conserved. (A.C.)

4959

INVESTIGATION ON THE HEAVY NUCLEI IN PRIMARY COSMIC RADIATION. Wolfgang Püschel (Max-Planck-Inst. für Physik, Göttingen, Ger.). Z. Naturforsch. 13a, 801-8(1958) Oct. (In German)

Fragmentation probabilities and interaction mean free paths for the interaction of heavy nuclei ($Z > 2$) of the primary cosmic radiation with target nuclei of emulsions (Ilford G 5) were obtained. The experiment was carried out in Northern Italy, at a geomagnetic latitude of 46°N. The values are in good agreement with those reported previously. Values are derived for the fragmentation probabilities in air by a geometrical model. Assigning both to the incident particle and to the target nuclei a radius $R = R_0 \times A^{\frac{1}{3}}$, one obtains an effective nuclear radius $R_0 = 1.2 \times 10^{-13}$ cm. Using the calculated values for the fragmentation probabilities, the ratio for the fluxes of L-nuclei to M-nuclei at the top of the atmosphere is increased from 0.46 to about 0.80. (auth)

4960

THE THEORY OF THE ABSORPTION OF MONOENERGETIC ELECTRONS IN METALLIC FOILS. H. Meister (Max-Planck-Inst. für Physik, Göttingen, Ger.). Z. Naturforsch. 13a, 809-20(1958) Oct. (In German)

The self-absorption of monoenergetic electrons in homogeneous activated layers, as well as the absorption in absorber foils pressed on both sides, was calculated approximately from the scattering and stopping properties of the material. The calculations were made for electron energies of 0.1 to 2 Mev and absorber materials of not too small atomic number ($Z > 30$). In the initial part of the electron path straight-line propagation was assumed, which with the energy E' changes

abruptly to complete diffusion according to the Bethe, Rose, and Smith theory (Proc. Amer. Phil. Soc. 78, 573 (1938)). E' was so chosen that the average quadratic distance of the electron distribution in an infinitely expanding medium, calculated from the transport theory, was approximated as well as possible by this approximation. The absorption curves of the In^{115*} conversion electrons measured in previous works (initial energy E_0 = 312 kev) are in agreement with the theoretical calculations for the absorbers In and Au; in Al, for which the theory is not valid, larger deviations appeared. (tr-auth)

4961

DETERMINATION OF THE DIFFUSION PARAMETER OF THERMAL NEUTRONS IN WATER BY A CONTAMINATION METHOD. K. H. Beckurts and O. Klüber (Inst. für Neutronenphysik und Reaktortechnik der Kernreaktor-Bau- und Betriebsgesellschaft mbH., Karlsruhe, Ger.). Z. Naturforsch. 13a, 822-5(1958) Oct. (In German)

The determination of the diffusion parameter of thermal neutrons in light water by a simple stationary method is reported. The analogy of this method to the non-stationary pulse method is discussed. The results are compared with the values obtained by the pulse method. (tr-auth)

4962

(p,γ) ANGULAR DISTRIBUTION MEASUREMENTS ON $F^{19}(p,\alpha\gamma)O^{16}$ AT 340, 598, AND 669 kev. Th. Retz-Schmidt (Physikalischen Staatsinstitut, Hamburg). Z. Naturforsch. 13a, 833-8(1958) Oct. (In German)

Experimental investigations of the behavior of the 6.14-Mev radiation in the $F^{19}(p,\alpha\gamma)O^{16}$ reaction gave the following angular distributions: $I_\gamma(669) \sim$ isotrop, $I_\gamma(598) \sim 1 + 0.17\cos^2\theta$, and $I_\gamma(340) \sim 1 - 0.035\cos^2\theta$. The result in the last case which deviates from earlier measurements is in better agreement with the basic assumption that in addition to the s-protons approximately 1% d-protons participate in the reaction at E_p = 340 kev. (tr-auth)

4963

INVESTIGATION OF NUCLEAR DISINTEGRATIONS PRODUCED BY CHARGED COSMIC RAYS. G. V. Khrimyan (Inst. of Physics, Academy of Sciences, Armenian SSR). Zhur. Eksptl'. i Teoret. Fiz. 35, 1076-82(1958) Nov. (In Russian)

Results of investigations of nuclear disintegration products generated by the charged component of cosmic radiation are presented. Some methods of separating nuclear disintegrations from showers produced by electromagnetic interaction of μ mesons are indicated. A differential momentum spectrum of secondary particles created in stars with n > 2 were found. It is shown that for generated π mesons the ratio $N(\pi^+)/N(\pi^-)$ is equal to 1.18 ± 0.23 in the momentum range from 0.12 to 0.9 Bev/c. Negative pions comprise 53 ± 5% of secondary particles possessing momenta ≥ 1 Bev/c. The ratio of the number of charged to neutral star-producing particles with energies ~30 Bev is 1.2 ± 0.16. (tr-auth)

4964

MEASUREMENT OF THE COSMIC RAY INTENSITY IN THE STRATOSPHERE AT VARIOUS HEIGHTS AND LATITUDES. A. N. Charakhchyan and T. N. Charakhchyan (Lebedev Inst. of Physics, Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 35, 1088-1102 (1958) Nov. (In Russian)

Results of measurements of the altitude dependence of particles of the cosmic-ray soft component possessing different ranges are presented for latitudes of 51 and 31°. The altitude dependence of electrons of a given energy is computed on the basis of the energy spectrum of μ-meson production in the atmosphere. The results of the calculations are in good agreement with the results of measurements performed at a latitude of 31° which indicates that the overwhelming majority of particles of the soft component are electrons generated by π mesons at the indicated latitude. An analysis of the experimental and calculated values for a latitude of 51° indicates the existence of an excess of electrons possessing ranges below 2 to 3 g/cm². This phenomenon which is most pronounced at 51° is probably caused by γ quanta emitted in the atmosphere in reactions involving neutron evaporation. The energy flux carried away by these surplus short-range electrons comprises ~10% of the total energy flux of the electron component at this latitude. The magnitude of the cosmic-ray energy flux at latitudes of 2, 31 and 51° was determined. On basis of these data and data on the intensity of cosmic-ray particles at the top of the atmosphere at latitudes 51 and 31°, an expression was obtained for the primary particle energy spectrum. The primary cosmic-ray particle flux ($N_p + N_\alpha$) at the equator (2°) was found to be 0.48 ± 0.04 particles/min·cm²·sterad. (tr-auth)

4965

APPLICATION OF MAGNETIC SLITS FOR CREATION OF CIRCULAR PARTICLE TRAJECTORIES. V. M. Kelman, V. A. Kolyunov, and M. V. Karpov (Leningrad Inst. of Physics and Tech., Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 35, 1113-15(1958) Nov. (In Russian)

An electron optical system consisting of magnetic slits arranged in a circle is proposed which can be employed to obtain almost circular charged particle trajectories. The magnetic field strength in such a system rapidly increases with the distance from the axis, but this does not lead to defocusing in the vertical direction. Thus a system of this type can be employed in an accelerator with a constant guiding field. The path of an electron beam during its first circuit in the system under consideration was studied. (tr-auth)

4966

ACCELERATION OF COSMIC RAYS IN FLUCTUATING MAGNETIC FIELD. V. M. Byakov and R. G. Avalov. Zhur. Eksptl'. i Teoret. Fiz. 35, 1181-4(1958) Nov. (In Russian)

A mechanism of acceleration of cosmic rays is considered in fluctuating magnetic fields of the galaxy or the atmospheres of some types of stars. During the motion of cosmic particles in these fields the diffusion in energy, as well as systematic acceleration, takes place. Computations indicate that the mechanism considered here may be more efficient than the Fermi acceleration mechanism. (tr-auth)

4967

DOUBLE ELASTIC SCATTERING OF DEUTERONS IN A MAGNETIC FIELD. G. R. Khutsishvili and O. D. Cheishvili (Inst. of Physics, Academy of Sciences, Georgian SSR). Zhur. Eksptl'. i Teoret. Fiz. 35, 1226-31(1958) Nov. (In Russian)

Double elastic scattering of deuterons in a magnetic field is considered. An expression for the angular dis-

tribution of double elastic scattering was obtained. Particular cases of transverse and longitudinal fields are examined. (tr-auth)

4968

RADIATION DECAY OF $\pi^{\pm}$-MESON AND CONSIDERATIONS FOR NON-CONSERVATION OF PARITY. A. I. Mukhtarov and S. G. Gadzhiev (Azerbaid-zhan State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 35, 1283-5(1958) Nov. (In Russian)

Studies of $\pi^{\pm} \rightarrow \mu^{\pm} + \nu + \gamma$ decay indicated nonconservation of parity in mixed interactions. The data obtained show that in the case of π meson neutrino decay with the weak μ meson pulse, the spin and γ quanta form an angle of 180°. In case of antineutrino decay the angle is close to zero. This conclusion can be verified by μ-γ correlation. (R.V.J.)

4969

DEPOLARIZATION OF μ^+ MESONS IN NUCLEAR EMULSIONS WITH VARIABLE GEL CONTENT. Yu. M. Ivanov and A. I. Fesenko (Moscow Inst. of Engineering Physics). Zhur. Eksptl'. i Teoret. Fiz. 35, 1297-8(1958) Nov. (In Russian)

In order to determine the relation of μ^+ meson spin depolarization to the content of each component in the emulsion, studies were made of the forward-backward electron emission asymmetry in μ^+ decay. The results are tabulated. Also, 1198 events of $\pi^+ - \mu^+ - e^+$ decay were studied in tetra-diluted emulsion with $(C_2H_4OH)_3N$. In the recorded events, μ^+ mesons stopping at the emulsion surface (the boundary bands were taken as 50 μ of non-exposed emulsion) were excluded. The number of invisible decay electrons was 10. The coefficient of asymmetry was (0.182 ± 0.058). (R.V.J.)

4970

OBSERVATIONS OF NUCLEO-ACTIVE $>10^{13}$ ev COSMIC PARTICLES. E. A. Murzina, S. N. Mikol'skii, and V. I. Yakovlev (Lebedev Inst. of Physics, Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 35, 1298-1300(1958) Nov. (In Russian)

The intensities of nucleo-active cosmic particles at high energies were measured in the autumn of 1957 at 3860 m elevation. The experimental data showed that in 81 ± 3% of the recorded instances nucleo-active particles with energies $\geq 3 \times 10^{12}$ ev were accompanied by wide atmospheric showers with $>3 \times 10^3$ particles. About 83 ± 4% of the observed events with particles of $>1.5 \times 10^{13}$ ev were followed by wide atmospheric showers. Consequently, the magnitude of the following showers does not depend much on energy of the nucleo-active particles. At the energy interval 10^{12} to 10^{13} ev the energy spectra is expressed as $F(>E) \sim 1/E^{1.53 \pm 0.07}$, which is in agreement with the primary cosmic radiation spectrum. It was also observed that the number of $\geq 3 \times 10^{13}$ ev particles was smaller than expected, assuming the conservation of similarity with the primary cosmic radiation spectrum. (R.V.J.)

4971

STATISTICAL INTERPRETATION OF EXPERIMENTAL DATA ON MULTIPLE PARTICLE PRODUCTION AT 1 TO 20 Bev. V. M. Maksimenko (Lebedev Inst. of Physics, Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 35, 1302-4(1958) Nov. (In Russian)

Experimental data are presented on the multiple production of particles in nucleon–nucleon collisions at several Bev and compared with the Fermi statistical theory for multiple production of particles. The results confirm the previously made conclusion (for the p–p, n–p, and π–p collisions at other energies) that the Fermi theory, with considerations for the isobar state, describes satisfactorily the multiple production and pulse distributions in nucleon–nucleon and π meson–nucleon collisions at several Bev. However, without consideration for the isobar state, the Fermi theory is not in such good agreement with experiment. It must be mentioned also, that the particle angular distributions in the experiment were not in agreement with the Fermi predictions. (R.V.J.)

4972

ON THE PENETRATING COMPONENT OF EXTENSIVE ATMOSPHERIC SHOWERS. R. E. Kazarov and R. B. Lyudvigov (Inst. of Physics, Akademy of Sciences, Georgian SSR). Zhur. Eksptl'. i Teoret. Fiz. 35, 1310-11(1958) Nov. (In Russian)

An analysis was made of previous work on penetrating component energy spectra. Supplementary data at 127 m depth were recorded with two identical detectors. The half-radius R of μ-meson distribution is 30 ± 5 m, while in previously reported data at 61 m depth R is 34 ± 3 m. (R.V.J.)

4973

ENERGY SPECTRA AND NUCLEAR INTERACTIONS OF COSMIC RAY PARTICLES. N. M. Kocharyan, G. S. Saakyan, and Z. A. Kirakosyan (Inst. of Physics, Academy of Sciences, Armenian SSR). Zhur. Eksptl'. i Teoret. Fiz. 35, 1335-49(1958) Dec. (In Russian)

Results of investigations made at 3200 m altitude during 1953 to 1956 are presented. The energy distributions of protons and μ mesons with energies up to 100 Bev were investigated. The measured proton and μ-meson spectra can be approximated respectively by the expressions $3.2 \times 10^{-3} (2 + E)^{-2.8} dE$ (for $E > 3$ Bev) and $0.5 (5 + E)^{-3} dE$ (for $E > 4$ Bev). Data are presented for the cross sections for inelastic nuclear interaction of high-energy π mesons and protons in graphite, copper, and lead. The proton and π-meson inelastic nuclear interaction cross sections (σ_a) were found to be equal. In graphite, copper, and lead, respectively, the following values were found: $\sigma_a = 0.65$ to $0.75\ \sigma_0$, and $0.9\ \sigma_0$, where $\sigma_0 = \pi(1.4 \times 10^{-13} A^{1/3})^2$ is the geometrical nuclear cross section. (tr-auth)

4974

TRIPLE SCATTERING OF 660 Mev PROTONS. I. MEASUREMENT OF THE DEPOLARIZATION PARAMETER D (90°). Yu. P. Kumekin, M. G. Meshcheryakov, S. B. Nurushev, and G. D. Stoletov (Joint Inst. of Nuclear Research). Zhur. Eksptl'. i Teoret. Fiz. 35, 1398-1401 (1958) Dec. (Ir Russian)

Experiments on triple scattering of 600-Mev protons are described. The depolarization parameter D (90°) was found to equal 0.93 ± 0.17. The result indicates that pp scattering through an angle of 90° is mainly due to the $C(\sigma_1 + \sigma_2)n$ term in the scattering matrix. (tr-auth)

4975

A MODEL OF THE MULTIPLE PRODUCTION PROCESS. G. I. Kopylov (Joint Inst. of Nuclear Research). Zhur. Eksptl'. i Teoret. Fiz. 35, 1426-34(1958) Dec. (In Russian)

The suggestion of constructing the random stars table capable of reproducing the theoretical concepts about the multiple production of elementary particles in the form suitable for comparing with experiments is discussed. It is shown that a table of this type can be set up for energies up to 10 Bev. (tr-auth)

4976

RADIATION FROM A CHARGED PARTICLE TRAVERSING A LAMINAR MEDIUM. G. M. Garibyan (Inst. of Physics, Academy of Sciences, Armenian SSR). Zhur. Eksptl'. i Teoret. Fiz. 35, 1435-9(1958) Dec. (In Russian)

The transition radiation which appears when a charged particle passes through a large number of plates separated by vacuum is considered. (tr-auth)

4977

ON TRANSVERSAL OF MATTER BY HIGH ENERGY μ-MESONS. I. L. Rozental and V. N. Strei'tsov (Lebedev Inst. of Physics, Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 35, 1440-6(1958) Dec. (In Russian)

The transversal of thick layers of matter by high energy μ mesons is considered with account of ionization losses, bremsstrahlung, emission of pairs, and star production. Distributions of energy losses are taken into account for the last three processes. It is shown that account of distribution functions leads to a decrease of the μ-meson flux at sea level computed on basis of the mean energy losses. (tr-auth)

4978

ABSORPTION OF POLARIZED μ^--MESONS BY NUCLEI. ANGULAR DISTRIBUTION OF THE NEUTRONS. E. I. Dolinskii and L. D. Blokhintsev (Moscow State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 35, 1488-98(1958) Dec. (In Russian)

The angular distribution of neutrons produced in the absorption of polarized μ^- mesons by nuclei is calculated. Numerical calculations are performed for O^{16} and Ca^{40}. (tr-auth)

4979

ASYMPTOTIC THEORY OF ONE-DIMENSIONAL FOUR-FERMION INTERACTION. A. A. Anselm (Leningrad Inst. of Physics and Tech., Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 35, 1522-31(1958) Dec. (In Russian)

A fermion field which interacts with itself is examined for the case when a single space and a single time coordinate are involved. Asymptotic expressions for the vertex part and Green's function were obtained by summation of an infinite number of graphs. It is shown that the theory is practically devoid of divergences and that renormalization of the charge is absent. It is found that whereas the one-limit procedure leads to a correct expression for the first term in the expansion of the exact solution in an asymptotic series, the two-limit procedure yields an incorrect result. The theory is compared with the exact solution obtained by Thirring. (tr-auth)

4980

MEASUREMENTS OF INTERNAL CONVERSION ELECTRON POLARIZATION. V. A. Lyubumov and M. E. Vishnevskii (Moscow State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 35, 1577-9(1958) Dec. (In Russian)

Due to nonconservation of parity the nucleus left after β decay is polarized in the direction of the emitted β electron. Consequently, in the internal conversion after β decay, conversion electrons should possess a certain polarization related to the direction of β electron emission. Results are presented of measurements of polarization of internal conversion electrons following Hg^{203} β decay. (R.V.J.)

4981

UNIVERSAL FERMI INTERACTION AND CAPTURE OF μ MESONS IN HYDROGEN. Chou Guan-Chao and V. Maevskii (Joint Inst. of Nuclear Research). Zhur. Eksptl'. i Teoret. Fiz. 35, 1581-2(1958) Dec. (In Russian)

The process of μ capture and verification of the universal (V-A) interaction in the case of β decay and μ-meson decay within the (V-A) theory are discussed. Expressions were developed for the capture probability, angular distribution, and polarization of neutrons in polarized μ-mesons capture by protons, with the Gell-Mann and Feynman assumption that the universal (V-A) interaction is conserved. (R.V.J.)

4982

ON THE ELECTRON-PHOTON COMPONENT SPECTRUM IN WIDE ATMOSPHERIC SHOWERS. I. A. Ivanovskaya and I. V. Rakobol'skaya (Lebedev Inst. of Physics, Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 35, 1583-4(1958) Dec. (In Russian)

Experiments were performed at sea level in which 70% of the wide atmospheric shower passed at 0 to 3 m distance from the Wilson chamber. The number of shower particles was $\approx 3 \times 10^4$. Some 343 showers were recorded, and an integral energy spectrum of the electron-photon component was plotted. The results were compared with the previously reported data of I. A. Ivanovskaya et al. (Zhur. Eksptl'. i Teoret. Fiz. 33, 358(1957)) and T. V. Danilova (Zhur. Eksptl'. i Teoret. Fiz. 34, 541(1958)). Descrepancies in the data are analyzed, and some explanations are given. (R.V.J.)

Heat Transfer and Fluid Flow

4983 AECU-3970

Griscom-Russell Co., Massillon, Ohio.

HEAT TRANSFER AND PRESSURE LOSS PERFORMANCE OF GRISCOM-RUSSELL SPECIAL SMALL K-FIN HELICALLY FINNED TUBES. Theodore C. Carnavos. May 1958. 42p. For Pratt and Whitney Aircraft Div. (RT-2-58). $1.25(OTS).

A limited experimental program has been conducted to determine the heat transfer and pressure loss characteristics of Griscom-Russel special small K-Fin tubes arranged in twelve different surface arrangements. The data are presented in graphical form using the Colburn factor, j, and the Fanning friction factor, f, versus the Reynolds Number, Re. Certain comparisons have been made among the surfaces tested to establish behavior patterns when there was only one geometrical variable. In addition a comparison is made where the finned tube is changed but approximate geometric similarity is maintained. (auth)

4984 CF-59-1-56

Oak Ridge National Lab., Tenn.

ROOM TEMPERATURE WATER STUDIES OF THE CONICAL BOTTOM SLURRY CORE VESSEL. R. P. Wichner. Jan. 12, 1959. 20p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

Water studies were performed on the conical bottom, bottom-polar inlet, core vessel to provide design information for the high-pressure model being installed in the 300SM loop. Maximum heat transfer coefficients are obtained in the conical portion of the core vessel when the inlet nozzle is inserted into the core up to the point of extension of the imaginary continuation of the

top hemisphere. The flow rate in the by-pass of the 300SM loop was calculated to be 9.5 to 11 gpm (7 to 8 ft/sec). The assumptions on which this calculation was based were checked experimentally by installing a similar by-pass in a low pressure mockup using an almost identical core vessel. The flow pattern was observed by using dye probes. Boundary layer flow exists at the wall of the upper hemisphere, while the flow in the conical portion of the core is characterized by large eddies extending to the vessel wall. (auth)

4985 PIBAL-479

Brooklyn. Polytechnic Inst.

EXPERIMENTAL INVESTIGATION OF TRANSPIRATION COOLING IN TURBULENT PIPE FLOW. S. W. Yuan and A. Barazotti. Aug. 1958. 43p. Project No. NR 094-342. Contract Nonr-839(16).

The effect of coolant air injection at the wall on the velocity and temperature distributions of the turbulent flow in a porous-wall pipe was experimentally investigated. The experimental apparatus was designed to establish a fully developed turbulent pipe flow at the entrance to a five-inch-diameter porous-wall pipe test section. Main-stream Reynolds number was varied up to 300,000 for the isothermal case and corresponding weight flow for the non-isothermal case. The coolant flow to main-stream rates of 0.0008 to 0.018 was covered. The temperature range was between the ambient temperature and 900°F. The agreement between the theoretical results and the experimental data is found to be satisfactory. The results show that the wall-friction coefficient increases with the increase of coolant injection whereas the heat transfer coefficient decreases with the increase of coolant injection. Thus, the analogue between the heat transfer and momentum transfer does not exist in transpiration cooling of pipe flow. (auth)

4986

NOTE ON THE ANALOGY BETWEEN MOMENTUM TRANSFER AND HEAT OR MASS TRANSFER FOR A HOMOGENEOUS ISOTROPIC TURBULENT FIELD. Thomas J. Hanratty (Univ. of Illinois, Urbana). A.I.Ch.E. Journal 4, 495-6(1958) Dec.

A mathematical analysis is presented for a fully developed velocity profile in a pipe by using Taylor's statistical description of turbulent diffusion for a homogeneous isotropic field as the basis of an analogy between momentum transfer and mass transfer. (W.L.H.)

4987

FOR GASES AND VAPORS, GRAPHS GIVE TUBESIDE HEAT TRANSFER COEFFICIENTS FOR STREAMLINE AND TURBULENT FLOW. Ning Hsing Chen (M. W. Kellogg Co., Jersey City). Chem. Eng. 66, No. 1, 124-6(1959) Jan. 12.

Graphs are presented for quickly calculating tubeside heat transfer coefficients for gases and vapors in streamline and turbulent flow. (W.L.H.)

4988

PREDICT RATE OF MASS TRANSFER BY ANALOGY WITH HEAT TRANSFER. James O. Osburn (State Univ. of Iowa, Iowa City). Chem. Eng. 66, No. 1, 136-8(1958) Jan. 12.

Methods are discussed for predicting the rate of mass transfer for turbulent flow by analogy with heat transfer. (W.L.H.)

4989

FOR GASES AND VAPORS CHARTS GIVE TUBESIDE PRESSURE DROP FOR STREAMLINE OR TURBULENT FLOW. Ning Hsing Chen (M. W. Kellog Co., Jersey City). Chem. Eng. 66, No. 2, 111-14(1959) Jan. 25.

Charts are given for rapidly calculating tubeside pressure drop for streamline or turbulent flow of gases and vapors. (W.L.H.)

4990

FACTORS GOVERNING THE SELECTION AND DESIGN OF TUBULAR HEAT EXCHANGERS. E. A. D. Saunders. Ind. Chemist 34, 275-81(1958) June.

Factors governing the selection and mechanical and thermal design of tubular heat exchangers which are most suitable and economical for required duties are presented. Installation and handling are also included. (J.E.D.)

4991

CALCULATION OF MASS TRANSFER PROCESSES. V. V. Kafarov. Zhur. Priklad. Khim. 31, No. 5, 706-11 (1958). (In Russian)

Generalized equations of mass transfer in two-phase flow systems were obtained, taking into account the hydrodynamic interaction of phases. The concept of the dynamic surface fluctuation coefficient describing similitude of two-phase systems is introduced, which is based on fully developed free turbulence (emulsification) conditions. Analysis of available experimental data indicates that the calculation method proposed may be used in the design of diffusion equipment. (tr-auth)

4992

MASS TRANSFER IN TUBULAR FILM-TYPE DISTILLATION COLUMNS. A. P. Nikolaev. Zhur. Priklad. Khim. 31, No. 5, 711-18(1958). (In Russian)

Film-type distillation in tubes of unit mass transfer and equivalent height-to-diameter ratio larger than 100 may proceed under laminar, laminar-to-turbulent transition, and turbulent vapor-phase flow conditions. Equations are given for determining the mass transfer coefficients under the various conditions. The use of spiral turbulence promoters in tubes increases the mass transfer coefficients 2 to 3 times. Stable operation can be achieved under emulsification conditions. (tr-auth)

Nuclear Properties and Reactions

4993 ANU/P-187

Australian National Univ. Research School of Physical Sciences, Canberra.

THE (γ,n) AND (γ,2n) REACTIONS IN Pr^{141}. J. H. Carver and W. Turchinetz. 1958. 4p.

Samples of praseodymium oxide were irradiated with the bremsstrahlung from the Canberra 33-Mev electron synchrotron, and the induced activities were measured with a scintillation spectrometer. The measurement of the 3.4-min. Pr^{140} produced in the (γ,n) reaction is described. A similar method was used to determine the (γ,2n) cross section by measuring the yield of 4.5-hr Pr^{139}. (A.C.)

4994 ANU/P-188

Australian National Univ., Research School of Physical Sciences, Canberra.

NUCLEAR DEFORMATION AND THE PHOTODISINTEGRATION GIANT RESONANCES. J. H. Carver and W. Turchinetz. [1958]. 23p.

The effects of nuclear deformation and shell closure upon the photodisintegration giant resonances were investigated by measuring the (γ,n) cross sections for seven isotopes with $82 \leq N \leq 108$ using the bremsstrahlung from the 33-Mev Canberra electron synchrotron. The induced radioactivities were measured with a NaI(Tl) scintillation spectrometer. The most accurate results were obtained for the $Ta^{181}(\gamma,n)$ reaction leading to the 8.15-hr isomeric level of Ta^{180}, the yield of which was measured with ½% statistical accuracy at 250-kev intervals over the rising part of the activation curve. The giant resonance for the reaction measured in this way has a width of 5.3 Mev and shows no evidence for the splitting into two components predicted by recent calculations on the photodisintegration of spheroidal nuclei. In qualitative agreement with these calculations, it was found that the (γ,n) cross sections for the other distorted nuclei investigated (Nd^{150}, Sm^{154}, and Gd^{160}) have widths of 5.7, 6.5, and 5.3 Mev, respectively, while for the closed-shell nuclei Pr^{141}, Nd^{142}, and Sm^{144}, the corresponding (γ,n) cross sections have widths of 4.3 < 5.0, and 4.0 Mev. In addition, it was found that the (γ,n) cross sections for closed-shell nuclei have substantially larger high-energy tails than do those for spheroidal nuclei. (auth)

4995 ANU/P-190

Australian National Univ. Research School of Physical Sciences, Canberra.

HIGH-ENERGY PHOTOPROTONS FROM SILVER. K. H. Lokan. Nov. 1958. 17p.

The energy distributions and absolute yields of photoprotons of energy greater than 10 Mev from silver were measured for maximum bremsstrahlung energies between 16 and 32 Mev. The derived cross section for this component, which may be identified as arising from direct interactions, passes through a maximum at ~22 Mev, and the integrated cross section is found to be (36 ± 9) Mev-mb. This result is consistent with the idea that most of the emission arises from a 2p–2d transition at 22 Mev, and this interpretation is supported by the angular distribution measured at 30 Mev, which is strongly anisotropic. (auth)

4996 ANU/P-193

Australian National Univ. Research School of Physical Sciences, Canberra.

COMPETITIVE PROCESSES IN THE PHOTODISINTEGRATION OF NICKEL. J. H. Carver and W. Turchinetz. Sept. 1958. 12p.

Excitation functions were measured for the (γ,n), (γ,p), and (γ,pn + 2n) reactions in Ni^{58} and the (γ,p) reaction in Ni^{62}, from threshold to 32 Mev. A preponderance of protons is found from Ni^{58} with the ratio $\int_0^{32} \sigma(\gamma,p)dE / \int_0^{32} \sigma(\gamma,n)dE = 2.35 \pm 0.20$. The shapes of the (γ,n) and (γ,p) cross sections are found to be very similar, peaking near 19 Mev with widths of about 4.3 Mev. The $Ni^{58}(\gamma,pn + 2n)$ cross section increases monotonically from threshold to 32 Mev, and the integrated cross section is about 12% of the total which is $\int_0^{32} [\sigma(\gamma,n) + \sigma(\gamma,p) + \sigma(\gamma,pn + 2n)]\, dE = (0.84 \pm 0.10)$ Mev-barns. The $Ni^{62}(\gamma,p)$ reaction is found to have an integrated cross section of (0.13 ± 0.02) Mev-barns and to peak at 22 Mev, with a width of about 5.2 Mev. (auth)

4997 ANU/P-197

Australian National Univ. Research School of Physical Sciences. Canberra.

A STUDY OF THE GIANT RESONANCE REGIONS OF Be^8 AND C^{12} THROUGH THE INVERSE REACTIONS $Li^7(p,\gamma)Be^8$ AND $B^{11}(p,\gamma)C^{12}$. D. S. Gemmell, A. H. Morton, and E. W. Titterton. [1958]. 17p.

In a search for fine structure in the giant resonance of C^{12}, an experiment was carried out to determine the excitation function for the ground-state gamma rays of the reaction $B^{11}(p,\gamma)C^{12}$ for protons in the energy range 4 to 7.7 Mev. The measured cross sections can be related to the $C^{12}(\gamma,p)B^{11}$ cross sections through the principle of detailed balancing. The experiment locates the maximum of the $C^{12}(\gamma,p)$ giant resonance at 22.55 (± 0.1) Mev but does not resolve individual levels. The cross section curve, however, is not smooth, and two peaks at C^{12} excitations of 21.4 and 22.1 Mev are suggested. The maximum value of the $C^{12}(\gamma,p)$ cross section is found to be (29 ± 5) mb. The reaction $Li^7(p,\gamma)Be^8$ was also investigated over a similar range of proton energies. Transitions to the 2.9-Mev level of Be^8 are found to predominate over those to the ground state throughout the energy range. The experiment suggests that the reaction $Be^8(\gamma,p)Li^7$, if it could be observed, would have a cross section maximum at 22 Mev. (auth)

4998 ANU/P-198

Australian National Univ. Research School of Physical Sciences, Canberra.

GAMMA RADIATION FROM THE CAPTURE OF 5 TO 7.7 MEV PROTONS IN F^{19}, Na^{23}, Al^{27} AND P^{31}. D. S. Gemmell, A. H. Morton, and W. I. B. Smith. Nov. 1958. 12p.

Pronounced resonances were observed in the yield of gamma rays with variation of proton energy from 5 to 7.7 Mev in steps of 70 kev for the reactions $F^{19}(p,\gamma)Ne^{20}$, $Na^{23}(p,\gamma)Mg^{24}$, $Al^{27}(p,\gamma)Si^{28}$, and $P^{31}(p,\gamma)S^{32}$. The energy of the protons from the Canberra cyclotron was changed by interposing aluminum foils in the beam. Gamma-ray yields for transitions to the ground and first excited states of the product nuclei were measured using a large sodium iodide crystal spectrometer. Estimates of the appropriate cross sections for these reactions are given. (auth)

4999 ANU/P-200

Australian National Univ. Research School of Physical Sciences, Canberra.

THE $Ni^{58}(n,p)Co^{58}$, $Ni^{58}(n,2n)Ni^{57}$ AND $Ni^{58}(n,np)Co^{57}$ CROSS-SECTIONS AT 14.1 MEV. K. H. Purser and E. W. Titterton. Nov. 1958. 3p.

Activation techniques were used to measure (n,p), (n,np), and (n,2n) reaction cross sections in Ni^{58} at 14.1 Mev. The measured values are: for (n,p), $(560 \pm 110) \times 10^{-27}$ cm²; for (n,np), $(160 \pm 40) \times 10^{-27}$ cm²; for (n,2n), $(38 \pm 8) \times 10^{-27}$ cm². (D.E.B.)

5000 BNL-402

Brookhaven National Lab., Upton, N. Y.

THE VALUE OF η_{nat}. R. Sher. June 25, 1956. 6p. $1.80(ph OTS); $1.80(mf OTS).

The resonance escape probability was measured in the BNL reactor and in about 18 uranium–water lattices. From these measurements and previous measurements of f, ϵ, M^2, and B^2, values of η_{nat} are inferred. The results are discussed. (W.D.M.)

5001 CF-58-12-9

Oak Ridge National Lab., Tenn.

TABLE OF GAMMA-ENERGY ABSORPTION CROSS SECTIONS. Lloyd G. Alexander. Dec. 1, 1958. 20p. Contract W-7405-eng-26. $3.30(ph OTS); $2.40(mf OTS).

The gamma-energy absorption cross sections for 24 elements were computed and are presented in tabular

form. In this computation, the low-energy cut-off was set at 0.1 Mev. (W.D.M.)

5002 NP-7160

Brussels. Centre d'Étude de l'Énergie Nucléaire. DIFFUSION ELASTIQUE ET INELASTIQUE PAR LES POLYCRISTAUX DE Be, Bi, C, ET NaCl. (Elastic and Inelastic Scattering by Polycrystals of Be, Bi, C, and NaCl.) H. Pollak. Nov. 19, 1957. 23p.

The cross sections for the elastic and inelastic scattering of neutrons by polycrystals of Be, Bi, C, and NaCl were calculated. (J.S.R.)

5003 WASH-1006

Nuclear Cross Sections Advisory Group, AEC. REPORTS TO THE AEC NUCLEAR CROSS SECTIONS ADVISORY GROUP, UNIVERSITY OF CALIFORNIA RADIATION LABORATORY, LIVERMORE, CALIFORNIA, JUNE 18-19, 1958. V. L. Sailor. 40p. $1.25 (OTS).

The cross section research programs at ANL, BNL, Columbia Univ., Duke Univ., KAPL, HAPO, LASL, ORNL, Phillips Petroleum Co., Rice Inst., and UCRL are reviewed. Data are reported from the following studies: (p,n) reaction cross sections; α spectra from t + t interaction; d(t,α), He^4(t,t), and t(t,t) scattering cross sections; (n,γ) activations and cross sections; (n,2n) and (n,3n) reactions in fissionable nuclei; neutron scattering from Be; neutron resonances in Pm^{147} and I^{129}; U^{233} fission yields; neutron total and (n,2n) cross sections for elements; and neutron spectra from d(p,np) reactions. (For preceding period see WASH-745.) (D.E.B.)

5004 AEC-tr-3515

GAMMA-RAYS SPECTRA RADIATIONAL CAPTURE OF NEUTRONS FOR EVEN-EVEN RADIATING NUCLEI WITH ROTATING LEVELS. L. V. Groshev, A. M. Demidov, V. N. Lutsenko, and V. I. Pelekhov. Translated for Atomics International, Canoga Park, Calif. from Atomnaya Energ. 4, 5-21(1958). 17p.

The gamma spectra of thermal neutron capture by gadolinium, erbium, hafnium, dysprosium, and tantalum were measured with a Compton magnetic spectrometer. Energies and intensities of the gamma lines were determined. For the first three elements, the radiating nuclei are the even-even nuclei Gd^{156}, Gd^{158}, Er^{168}, and Hf^{178}, which possess a rotating level structure in the vicinity of the ground state. (W.D.M.)

5005 AEC-tr-3521

NUCLEAR CHARGE DISTRIBUTIONS AND COMPARISON WITH RELATED EXPERIMENTS. Liu Han-Chao. Translated from Acta Phys. Sinica 12, 177-81(1956). 9p. $0.50(OTS).

Results from experimental studies of high-energy electron scattering and x-ray emission from μ-mesic atoms were used in nuclear charge distribution determinations. Charge distributions indicated by the two experimental methods were compared with each other and with distribution values predicted by the Thomas-Fermi model. Plots of experimental and theoretical values are given which show reasonable agreement. (D.E.B.)

5006 CEA-tr-R554

LA DÉSINTÉGRATION-α. (α Disintegration.) L. L. Goldine, L. K. Peker, and G. I. Novikova. Translated by [H.] Bourrely from Uspekhi Fiz. Nauk 59, 459-542 (1956). 97p.

A review is presented of the experimental and theoretical work on alpha decay. The topics discussed include experimental techniques and alpha and gamma correlations, classical theory of alpha decay, alpha decay with respect to the ground levels of the daughters, non-sphericity of levels, the rotation structure of excited levels, rotation level and the fine structure of alpha radiation, intensity of radiations in alpha decay and preferred and forbidden transitions, and intensity of alpha transition on rotation levels. 286 references. (J.S.R.)

5007 CEA-tr-R556

NOMBRES DE MASSE DES ISOTOPES DU DYSPROSIUM DÉFICIENTS EN NEUTRONS. (Mass Numbers of Neutron-Deficient Dysprosium Isotopes.) A. N. Dobronova, L. M. Krijansky, A. M. Mourine, and V. N. Pokrovsky. Translated from Izvest. Akad. Nauk S.S.S.R. 22, 815-16(1958). 5p.

Studies of the genetic bonds of Dy isotopes with Tb and Gd daughter elements indicated the possible existence of isotopes with A = 159, 157, 155, and 153. To verify this, an attempt was made to determine directly the Dy isotopic masses formed in Ta deep spallation. The Dy fraction was separated by mass spectrometer, and the γ spectra of separated Dy isotopes were determined with a scintillation spectrometer. The results confirmed the existence of Dy with A = 159, 157, 155, 153, and possibly, 151. The weak activity of Dy^{159} and still weaker Dy^{151} prevented further studies. The following data were found for Dy^{157}: $T_{1/2}$ = 8.5 + 0.5 hr; no daughter activity observed; γ spectrum lines 80 and 325 kev. For Dy^{155}: $T_{1/2}$ = 9 ± 2 hr; daughter activity with $T_{1/2}$ ~ 5 days (Tb^{155}); γ spectrum lines 80 and 227 kev. For Dy^{153}: $T_{1/2}$ = 7 ± 3 hours; daughter activity with $T_{1/2}$ ~ 2 days (Tb^{153}); γ spectrum line 80 kev. (R.V.J.)

5008

THE OPTICAL MODEL AND ITS JUSTIFICATION. Herman Fesbach (Massachusetts Inst. of Tech., Cambridge). Ann. Rev. Nuclear Sci. 8, 49-104(1958).

The optical model description of the scattering of a nuclear particle by a nucleus is dealt with. In this model the many-body problem arising from the interactions of the nucleons in the target nucleus with the incident particle is approximated by a two-body problem. The various interactions are replaced by a potential between the incident particle and the nucleus. (W.D.M.)

5009

THE NEUTRON YIELD FROM INELASTIC COLLISIONS BETWEEN NUCLEI AND 14-Mev NEUTRONS AND THE CROSS SECTIONS OF THE (n,2n) REACTIONS. P. P. Lebedev, Yu. A. Zysin, et al. Atomnaya Energ. 5, 522-5(1958). (In Russian)

The yield of neutrons from neutron inelastic interactions with the natural isotopic compositions of Bi, Cd, Cu, Fe, Hg, Mo, Pb, Sb, Sn, and U was measured. Measurements were made by determining the relative changes in total neutron flux and the attenuation of primary neutrons after their passage through the specimens. The magnitudes obtained for cross sections σ_{in} in inelastic interactions with nuclei of the above materials and the known magnitudes for neutron capture cross sections were used in calculations of the average (according to the isotopic content) cross sections for (n,2n) reactions. (R.V.J.)

5010

MEASUREMENT OF THE RADIATIVE CAPTURE CROSS-SECTION FOR 25-kev NEUTRONS. V. V.

Kononov, Yu. Ya. Stavisskii, and V. A. Tolstikov. Atomnaya Energ. 5, 564(1958). (In Russian)

Radiative capture cross sections for photoneutrons from an antimony–beryllium source at 25 kev were measured. Results are tabulated for Al^{27}, Cl^{37}, Cu^{65}, Ga^{69}, Mn^{55}, Ni^{64}, K^{41}, Si^{30}, Na^{23}, V^{51}, and Zn^{68}. (R.V.J.)

5011

THE EJECTION CROSS-SECTION FOR 2.9-Mev FAST NEUTRONS. V. I. Kukhtevich, B. I. Spitsyn, and S. G. Tsypin. Atomnaya Energ. 5, 565-6(1958). (In Russian)

The ejection cross sections of Al, B, C, Cu, Fe, Nb, Ni, and Pb at neutron energies of $E_0 = 2.9 \pm 0.1$ Mev were measured with a B^{10} enriched counter. The table showing the ejection cross sections and the minimum distances from the detector at which the cross sections were established is included. (R.V.J.)

5012

GENETIC MEASUREMENT OF THE HALF LIFE OF Bi^{207}. J. Sosniak and R. E. Bell (McGill Univ., Montreal). Can. J. Phys. 37, 1-4(1959) Jan.

The half life of Bi^{207} was measured by the genetic method, using the parent-daughter pair Po^{207} and Bi^{207} Both activities are electron capturers, and the measured half life depends only on the activity ratio between them. The value found, $T_{1/2} = 28 \pm 3$ years, agrees with one of three previous determinations of this half life. (auth)

5013

SOME PROPERTIES OF THE 2.23-MEV EXCITED STATE OF P^{31}. A. E. Litherland, E. B. Paul, et al. (Atomic Energy of Canada Ltd., Chalk River, Ont., Can.). Can J. Phys. 37, 53-62(1959) Jan.

The 2.23-Mev excited state of P^{31} was studied by means of the capture gamma rays from the 1.70-Mev resonance in the reaction $Si^{30}(p\gamma)P^{31}$. The angular correlation of the ground state gamma ray established that the resonance had total angular momentum 3/2, and triple correlation measurements of the cascading gamma rays from the compound state showed that the angular momentum of the 2.23-Mev state was 5/2. Coincidence measurements showed that the cascade gamma rays from the 2.23-Mev state to the first excited state at 1.27-Mev were $\leq 3\%$ of the transitions to the ground state. (auth)

5014

ON THE POSSIBILITY OF SUPERFLUID STATES OF NUCLEAR MATTER WHEN p-p AND n-n INTERACTIONS ARE TAKEN INTO ACCOUNT. V. G. Solov'ev (Joint Inst. of Nuclear Research). Doklady Akad. Nauk S.S.S.R. 123, 437-9(1958) Nov. 21. (In Russian)

Mathematical methods developed in the theory of superconductivity are applied in studies of properties of nuclear matter. Conditions which satisfy the p-p interaction potential were found in order to determine the superfluid state of nuclear matter. Studies were limited to p-p interactions (considered equal to n-n interactions). Only the part of the Hamiltonian pertaining to the appearance of the superfluid state was developed. (R.V.J.)

5015

THE INFLUENCE OF THE PSEUDOSCALAR INTERACTION IN THE DECAY OF Pr^{144}. G. Alaga, L. Šips, and D. Tadić (Institut "Ruder Bošković," Zagreb). Glasnik mat fiz. i Astron. Ser. II 12, 207-17(1957).

Previous measurements on the decay scheme of Pr^{144}–Nd^{144} were evaluated and summarized. The transition Pr^{144}–Nb^{144} was analyzed with considerations of the possible nuclear forces acting upon it, and a conclusion was derived that the pseudoscalar contribution is dominant in the transition. (R.V.J.)

5016

INTERNAL CONVERSION. M. A. Listengarten. Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 759-74(1958) July. (In Russian)

A review is presented of internal conversion theory and the agreement between theory and experiment. Available measures for correlating theory and experiment are analyzed. Tables of γ-ray internal conversion are included. (R.V.J.)

5017

CONVERSION ELECTRONS OF Yb^{169}. K. Ya. Gromov, B. S. Dzhelepov, and B. K. Preobrazhenskii (Khlopin Radium Inst., Academy of Sciences, USSR). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 775-84(1958) July. (In Russian)

Studies were made of Yb^{169} electron conversion spectra obtained from a deep spallation reaction in tantalum. The tantalum target was bombarded by protons for three months. Chromatographic separation was performed a week after the irradiation, and measurements were taken after two weeks. The decay scheme of Yb^{169} and the electron conversion spectrum are presented. Repeated measurements, made after a month interval, showed that the spectrum did not change with time, but conversion line intensities diminished with the half-life period of nearly 32 days. Results are presented in tables and graphs. (R.V.J.)

5018

ON THE Tl^{208} LEVEL SCHEMES. A. G. Sergeev, E. M. Krysyuk, G. D. Latyshev, V. D. Vorob'ev, and T. I. Kol'chinskaya (Obraztsov Leningrad Inst. of Transportation). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 785-7 (1958) July. (In Russian)

The γ transition multiplicities in $Bi^{212} \rightarrow Tl^{208}$ decay were determined on the basis of studies made of the radium–thorium precipitation spectrum of internal conversion electrons. The relative intensities of α transitions, with consideration for the displaced angular momentum, were calculated in order to verify and correct the Tl^{208} excitation levels. It is shown that consideration of the angular momentum improves considerably the theoretical and experimental agreement. The Tl^{208} decay levels are presented. Levels at 328, 473, 493, and 619 kev can be explained by the spallation of the $d_{3/2}g_{9/2}$ configuration. The spallation produces a quadruplet with spins 3^+, 4^+, 5^+, and 6^+. The values 3^+ and 6^+ for the levels 493 and 619 kev are in good agreement with the configuration; however, for the levels with spins 4^+ and 5^+ the sequence is not yet clear. (R.V.J.)

5019

β SPECTRA OF SHORT LIFE Al^{28} AND F^{17} ISOTOPES. S. S. Vasil'ev and L. Ya. Shavtvalov (Lomonosov Moscow State Univ.). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 788-90(1958) July. (In Russian)

The β and γ radiations of short-life isotopes were studied with a magnetic-lens β spectrometer and a scintillation γ spectrometer. The isotopes were prepared by bombarding targets with 4-Mev deuterons accelerated in a cyclotron and carried behind the shielding into the β-spectrometer chamber. The β spectra of Al^{28} obtained from the (d,p) reaction and the Fermi graph are shown. The upper boundary of the Al^{28} β

spectrum is 2820 ± 50 kev. The half life in the 1100-kev region, determined by the β spectrometer, was 2.1 ± 0.2 min; the half life determined with the scintillation γ spectrometer was 2.2 ± 0.1 min. The β spectrum of F^{17} obtained from (d,n) reactions in oxygen and the Fermi graph are also presented. The upper boundary is 1700 ± 15 kev. A considerable deflection from the straight line was observed on the Fermi graph starting with ~600 kev. The F^{17} half life period measured with β spectrometer (at 800 kev) was 71 ± 5 sec. The scintillation γ spectrometer did not detect any γ rays from the target after the deuteron bombardment was stopped. (R.V.J.)

5020

CONVERSION ELECTRON COINCIDENCES IN $Tb^{155} \rightarrow Gd^{155}$ DECAY. B. S. Dzhelepov, B. K. Preobrazhenskii, and V. A. Sergienko (Zhdanov Leningrad State Univ.). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 791-4(1958) July. (In Russian)

Tb^{155} was prepared in a target by 660-Mev proton bombardment for several hours and chromatographically separated after 20 to 30 hours. Coincidences were studied with a double magnetic-lens spectrometer. Measurements of $e^- - e^-$ coincidences were made several days after the separation when the short-period fraction had decayed. Coincidences were investigated in both the decay of Tb^{155} separated from the terbium fraction and then in that fraction accumulated from Dy decay. The Gd^{155} transition scheme plotted on the basis of $Tb^{155} \rightarrow Gd^{155}$ and $Eu^{155} \rightarrow Gd^{155}$ decays included some transitions observed in the decay of Tb^{155}: $h\nu$ = 31.6, 63, 148.8, 163.4, 181.6, 221.2, 239.7, and 350.8 kev. Moreover, the transition $h\nu$ = 57 kev was noticed in the decay of Tb accumulated from Dy^{155}, and the transitions $h\nu$ = 89 and 199 kev were found in the terbium fraction. A great number of doublets and triplets interfere with decoding of the decay. (R.V.J.)

5021

COINCIDENCES BETWEEN CONVERSION ELECTRONS IN Lu^{173} DECAY. VERIFICATION OF DECAY SCHEME OF $Lu^{173} \rightarrow Yb^{173}$. B. S. Dzhelepov, R. K. Preobrazhenskii, and V. A. Sergienko (Zhdanov Leningrad State Univ.). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 795-807 (1958) July. (In Russian)

Coincidences between certain conversion transitions in Yb^{173} appearing in Lu^{173} decay (T = 170 days) were investigated with a double-lens spectrometer. The data obtained substantiated the $Lu^{173} \rightarrow Yb^{173}$ decay scheme. Previously it was determined that the γ spectra of 170-day Lu from a prepared lutetium fraction and that from Lu accumulated from Hf decay are identical. Hence, the stability of Hf^{174} confirms that the lines belong to Lu^{173}. (R.V.J.)

5022

MASS NUMBER VALUES FOR GADOLINIUM WITH HALF-LIFE $T_{1/2}$ = 52 DAYS AND EUROPIUM HALF-LIFE $T_{1/2}$ = 4.3 DAYS. G. M. Gorodinskii, A. N. Murin, and V. N. Pokrovskii (Khlopin Radium Inst., Academy of Sciences, USSR). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 811-14(1958) July. (In Russian)

The spectrum of a gadolinium fraction obtained from a deep spallation reaction was studied with a scintillation γ spectrometer and a $\gamma-\gamma$ coincidence scintillation apparatus. Studies of the spectra from 52-day Gd show two γ lines of 115 and 150 kev in coincidence. The hypothetical decay scheme for 52-day Gd (considering the new data) and the decay scheme of 4.3 day Eu are presented. Energies of the first excitation level for the even-even parity nuclei of neodymium as a function of neutron number were plotted. (R.V.J.)

5023

ON THE NEW NEUTRON-DEFICIENT RARE EARTH ISOTOPES. LUTETIUM WITH MASS NUMBER 167. P. M. Aron, A. V. Kalyamin, A. N. Murin, and V. A. Yakovlev (Khlopin Radium Inst., Academy of Sciences, USSR). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 817 (1958) July. (In Russian)

The neutron-deficient isotopes were prepared by 660-Mev proton bombardment of Ta. A radioactive nuclide with half life 55 ± 3 min was chromatographically separated from the lutetium fraction. The characteristic Tm^{167} γ spectrum was observed in the thulium fraction separated simultaneously with ytterbium from the lutetium fraction. The intensity of the bright γ line with E_γ = 207 kev diminishes with the half life period of ~10 days (published value of Tm^{167} is 9.6 days). Consequently, the existence of the previously unknown Lu^{167} should be considered proven. (R.V.J.)

5024

ON THE LUTETIUM ISOTOPE WITH MASS NUMBER 173. G. M. Gorodinskii, A. N. Murin, V. N. Pokrovskii, and B. K. Preobrazhenskii (Khlopin Radium Inst., Academy of Sciences, USSR). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 818-20(1958) July. (In Russian)

A lutetium isotope with half life $T_{1/2}$ ~ 200 days, to which the mass number A = 173 was assigned, was found among the rare earth products from deep Ta spallation. The indicated $T_{1/2}$ differs from that previously assigned and is close to Lu^{174} (165 days). In order to confirm the identification of the isotope, it was separated from Hf. The γ spectrum of Lu^{173} was recorded with a "stationary" well coincidence scheme, and coincidences with the line E_γ = 79 kev are presented. The γ line at 79 kev coincides with the lines 101, 175, and 274 kev; the γ line at 175 kev coincides with the 101-kev line and with itself. The Lu^{175} decay scheme was developed, and the relative probabilities of various Lu^{173} quantum coincidences were calculated. The calculations are in satisfactory agreement with the experimental data. (R.V.J.)

5025

RELATIVE INTENSITIES OF Ho^{160} γ TRANSITIONS. E. P. Grigor'ev, B. S. Dzhelepov, and A. V. Zolotavin (Zhdanov Leningrad State Univ.). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 821-3(1958) July. (In Russian)

The photoelectron spectrum of Ho^{160} γ rays was studied using a 4 mg/cm^2 thorium target and (14.9 ± 0.1) and (2.9 ± 0.1) mg/cm^2 bismuth targets. The thick target was used for the hard lines and the thinner ones for 196-kev transitions. The ratio between the intensities of the 196-kev lines and harder ones was determined using the known thickness of the bismuth target. All measurements were made with one source. The energies and intensities of six strong γ transitions and conversion coefficients of Ho^{160} multiple transitions were determined, and the data are tabulated. The scheme of Dy^{160} levels is also included. (R.V.J.)

5026

STUDIES OF THE Th^{230} LOWER EXCITATION LEVELS BY MEANS OF $\alpha - e_K$ COINCIDENCES. A. P. Komar, G. A. Korolev, and G. E. Kocharov (Inst. of Physics and Tech., Academy of Sciences, USSR). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 824-6(1958) July. (In Russian)

A design is presented of a recording apparatus for $\alpha-e_K$ coincidences. The apparatus consists of a pulse ionization chamber with a proportional counter installed in it for recording electron conversions. The apparatus was used in studies of the U^{234} α spectrum in electron conversion coincidence. (R.V.J.)

5027

STUDIES OF Cs^{134} BY COINCIDENCE METHODS. Yu. A. Aleksandrov (Zhdanov Leningrad State Univ.). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 827-30(1958) July. (In Russian)

Cascade transitions of 797 to 605, 605 to 570, 797 to 605, 605 to 1370, and 805 to 1170 kev were reported previously. Gamma rays of 605 and 797 kev were found in $\beta-\gamma$ coincidences. Also, the γ quanta with energies 563 and 570 kev in coincidence with hard β spectrum components were found. Other work shows the presence of a γ coincidence of 1370 kev with the soft β spectrum component. The existence of γ rays with energies of 1640, 1750, 1870, 1960, and 2030 kev with an order of intensity of 10^{-6} quantum per decay was also found. In order to verify the decay scheme, further studies were made of the $\gamma-\gamma$ and $\beta-\gamma$ coincidences. (R.V.J.)

5028

ON THE As^{74} EMISSION. E. P. Grigor'ev, B. S. Dzhelepov, et al. Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 831-8(1958) July. (In Russian)

Radiochemically pure As^{74} was prepared and the decay scheme corrected and verified. (R.V.J.)

5029

ON THE Lu^{171} γ SPECTRUM. A. I. Lebedev, A. N. Silant'ev, and I. A. Yutlandov (Khlopin Radium Inst., Academy of Sciences, USSR). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 839-40(1958) July. (In Russian)

Lu^{171} was separated from the rare earth elements obtained in tantalum targets bombarded by fast protons. The basic activity of the preparation was Lu^{169} and Lu^{170}. The Lu^{169} isotope decays into Yb^{169} which, within a 30-day period, decays into Tm^{169}. The half-life period of Lu^{169} and Lu^{170} is about 2 days. After a month, the lutetium was chromatographically purified from Yb. The preparation contained only Lu with an 8-day decay period. The γ spectrum of the preparation was studied with a scintillation spectrometer. (R.V.J.)

5030

NEW DATA ON RELATIVE γ LINE INTENSITIES OF Ra IN EQUILIBRIUM WITH DECAY PRODUCTS. B. S. Dzhelepov, N. N. Zhukovskii, I. F. Uchevatkin, and S. A. Shestopalova (Mendeleev All-Union Research Inst. in Metrology). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 841-7(1958) July. (In Russian)

The γ spectrum of Bi^{214} was investigated with an ionization chamber which was adjusted to a divided vacuum. The chamber, under constant pumping, was filled with a mixture of argon (60%) and methane (40%). The operational environment reduced the background and improved the resolving power of the apparatus. Under the conditions described the Compton line width at half height was 3.0% at 400 kev and 1.5% at 1500 kev and above. The salts of $RaBr_2$ were used as the source. The experimental γ spectrum of Ra, in equilibrium with its decay products, in the regions 150 to 630, 630 to 1810, and 1780 to 2530 kev is presented. Energies and relative intensities of the γ lines between 200 to 2500 kev are tabulated. (R.V.J.)

5031

DETERMINATION OF THE NUMBER OF γ QUANTA PER La^{140} DECAY. E. A. Khol'nova (Mendeleev All-Union Research Inst. in Metrology). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 848-9(1958) July. (In Russian)

The experimental determination of the number of γ quanta per decay was based on the calorimetric measurements of the heat produced in absorption of β and γ rays emitted by the isotope. On the basis of existing data the mean value of the La^{140} β spectrum was evaluated to equal 445 kev. The number of γ quanta for the 1597-kev line, the relative intensity of which is taken as unity, is equal to 0.95. The number of γ quanta for other γ lines was calculated on the basis of the quantity found and their relative intensities. The mean γ energy per one decay was found to be 2200 kev. For β particles, the total mean energy per decay was 1310 kev, which is about 300 kev less than that given in decay tables. This indicates an error in the intensity of the initially used β component. However, the results hold for the γ quanta number. (R.V.J.)

5032

THE RATIO L/K FOR Dy^{159} AND Er^{165} AND EVALUATION OF ENERGY TRANSITIONS $Dy^{159} \rightarrow Tb^{159}$ AND $Er^{165} \rightarrow Ho^{165}$. O. I. Grigor'ev, B. S. Kuznetsov, N. S. Shimanskaya, and I. A. Yutlandov (Khlopin Radium Inst., Academy of Sciences, USSR). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 850-60(1958) July. (In Russian)

Various methods for determining the decay energy of isotopes subjected to electron capture are discussed. The method of L/K was found to be suitable for small energy transitions (< 200 kev) of isotopes with relatively simple decay schemes and having no strong cascade γ radiation. The method has limitations due to incomplete K-capture theory and incomplete data on quantitative and qualitative regularities in the atomic shell electron reconstruction process. The L/K ratio was determined for two neutron-deficient isotopes, Dy^{159} and Er^{165}, on the basis of the transition energy values of $Dy^{159} \rightarrow Tb^{159}$ and $Er^{165} \rightarrow Ho^{165}$. The design and performance of the γ spectrometer with proportional counter used for measuring the L and K radiation are described. The decay schemes of Er^{165} and Dy^{159} and levels of Tb^{159} are presented. The decay energy of Dy^{159} and Er^{165} was less than 100 kev; consequently, the L/K ratio method produced satisfactory results. (R.V.J.)

5033

THE LIFE TIME OF Mg^{24} PRIMARY EXCITATION STATE. N. N. Delyagin and V. S. Shpinel (Lomonosov Moscow State Univ.). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 861-6(1958) July. (In Russian)

The primary excitation state of Mg^{24} (1.37 Mev) was measured by the method of γ resonance scattering. The principle of the method and the scheme of the experiment are described. Measurements of γ resonance scattering quanta were made at 5 different temperatures from 800 to 880°C. The dependence of the effect on the temperature is analyzed. (R.V.J.)

5034

ELASTIC SCATTERING OF PROTONS BY Si^{28} NUCLEI. THE SPIN AND PARITY OF 4.31 AND 4.73 Mev LEVELS OF P^{29}. A. K. Val'ter, I. Ya. Malakhov, P. V. Sorokin, and A. Ya. Taranov (Inst. of Physics and Tech., Academy of Sciences, USSR). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 871-6(1958) July. (In Russian)

The proton scattering cross section of Si^{28} was meas-

ured in order to determine the characteristics of P^{29} excited states related to the resonance at proton energies of 1.65 Mev (width 60 kev), 2.09 Mev (width 25 kev), and the wide resonance at 2.9 Mev. The experimentally indicated resonance half-widths of 50 and 14 kev differ considerably from the previously reported values of 60 and 25 kev. The results of the phase analysis are tabulated. The level at 4.31 Mev is single, and the 4.73-Mev level has a more complex mechanism. Data on the spins and parities of the levels are confirmed by measurements of proton polarization in elastic scattering. (R.V.J.)

5035

PRECISION MEASUREMENTS OF γ LINE ENERGIES OF Co^{60} AT 1.17 AND 1.33 Mev, Hf^{181} AT 482 kev, AND Au^{199} AT 158 AND 208 kev. M. P. Avotina and O. I. Sumbaev (Mendeleev All-Union Research Inst. of Metrology). Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 22, 879-82(1958) July. (In Russian)

A design is given of a sinusoidal mechanism with an optical system of subtraction. The results of measurements are tabulated and correlated with previous data. (R.V.J.)

5036

NUCLEAR RESONANCE ABSORPTION OF GAMMA RADIATION IN Ir^{191}. Rudolf L. Mössbauer (Technische Hochschule, Munich and Max-Planck-Institut für Medizinische Forschung, Heidelberg, Ger.). Naturwissenschaften 45, 538-9(1958). (In German)

The resonance line of the 129-kev transition in Ir^{191} was determined by a "centrifuge method" at a temperature of 88°K. A value of 6.5×10^{-6} ev was obtained for the width of the 129-kev level and a lifetime of 1.0×10^{-10} sec. (J.S.R.)

5037

FISSION-NEUTRON CROSS SECTIONS FOR THRESHOLD REACTIONS. Robert S. Rochlin (General Electric Co., Schenectady, N. Y.). Nucleonics 17, No. 1, 54-5(1959) Jan.

Data are presented on fission neutron activation by the (n,p), (n,α), and (n,2n) reactions. Half lives, cross sections, and gamma-ray energies are tabulated for various reactions. Cross sections for these reactions are needed for calculating activation levels of reactor coolants and components. (J.H.M.)

5038

ON THE DECAY OF ^{185}W. A. Bisi and L. Zappa (Istituto di Fisica Sperimentale del Politecnico, Milan). Nuovo cimento (10) 10, 90-5(1958) Oct. 1.

The γ spectra from an electromagnetically enriched sample of W^{184} irradiated with pile neutrons were investigated. The decay of the various radiations was followed for more than three half lives of W^{185}. It was ascertained that the decay of W^{185} populates the first rotational level of Re^{185} at 125 kev with a branching ratio of about 0.3%. The K internal conversion of the γ ray was found to be 2.9 ± 0.3. (auth)

5039

ON THE COMPATIBILITY OF RELATIVISTIC WAVE EQUATIONS FOR PARTICLES OF HIGHER SPIN IN THE PRESENCE OF A GRAVITATIONAL FIELD. H. A. Buchdahl (Univ. of Tasmania, Hobart). Nuovo cimento (10) 10, 96-103(1958) Oct. 1.

It is known that the equations for particles of spin $\geq 3/2$ become inconsistent when electromagnetic interactions are introduced by the usual rules. An analogous problem is that of the effect of the introduction of gravitational fields on the consistency of the equations. The natural generalization of the usual field equations for particles of spin $3/2$ is considered in detail, and it is shown that the equations are compatible if and only if the Riemann space in which the spinor field is contemplated is an Einstein space. This result is discussed. (auth)

5040

CAPTURE OF μ-MESONS IN DEUTERIUM. H. Überall and L. Wolfenstein (CERN, Geneva). Nuovo cimento (10) 10, 136-49(1958) Oct. 1.

The neutron spectrum, the neutron asymmetry with respect to muon spin direction, and the neutron polarization are calculated as functions of neutron energy for μ-meson capture in deuterium. The total capture rate and the dependence of the rate on the hyperfine state of the mesic atom are given and compared to approximate expressions. The dependence of the observations on the amount of Fermi or Gamow-Teller coupling and on the presence of an effective pseudoscalar coupling is displayed. (auth)

5041

ON THE MOMENTUM DEPENDENCE OF THE NUCLEAR POTENTIAL. C. Villi (Univ. of Trieste and Istituto Nazionale di Fisica Nucleare, Trieste, Italy). Nuovo cimento (10) 10, 259-91(1958) Oct. 16.

It is shown that the potential energy of a nucleon in the nucleus, evaluated in the first approximation of the perturbation method or on the basis of Brueckner's theory, obeys a hyperbolic partial differential equation, which is independent of any nuclear parameter and is established by the antisymmetry properties of the nucleon assembly only. This nuclear equation rules the dependence of the potential both on the nucleon momentum and the nuclear density. The particular choice of the two-body forces or of the nucleon-nucleon phaseshifts for the evaluation of the potential energy of the nucleus implies a specialization of the Cauchy problem, related to this equation, regardless of the saturation prescriptions of nuclear forces. It is shown that there exists a class of solutions of this nuclear equation which cannot be derived, in the first approximation of the perturbation method from any of the known two-body potentials. This class of solutions, however, leads to the saturation of the nuclear binding energy and density as well as to the experimental value of the symmetry energy and to the correct behavior, in the low energy region, of the real and imaginary parts of the nuclear potential. A mathematical proof is given of the dependence of the potential inside the Fermi sphere on even powers of the nucleon momentum, as required by the invariance prescription of the potential with respect to time reflection. The linear dependence of the potential on the square of the nucleon momentum, and the so called nucleon effective mass approximation, is discussed in the light of the correspondence principle, which has been used to describe the motion of a nucleon in nuclear matter. Finally, it is shown that the Johnson-Teller, Schiff-Thirring, and Drell-Huang theories of nuclear saturation implicity involve only particular solutions of the considered nuclear equation. (auth)

5042

NUCLEAR POLARIZATION IN RADIATIVE K-CAPTURE. V. B. Beresteckij (Academy of Sciences, Moscow). Nuovo cimento (10) 10, 385-7(1958) Oct. 16.

A formula for the nuclear polarization in the process $e + p \rightarrow n + \nu + \gamma$ is given. (auth)

5043

CYCLOTRON BEAM INTENSITY MEASUREMENTS. Saadia Amiel and Norbert T. Porile (Brookhaven National Lab., Upton, N. Y.). Rev. Sci. Instr. 29, 1112-15 (1958) Dec.

A Faraday cup and target assembly for the determination of cross sections for nuclear reactions induced by charged particles from a 60-in. cyclotron is described. Independent checks and calibrations on the performance of the assembly were carried out. The conditions affecting the operation of this assembly are discussed. Cross sections for two standard alpha-induced reactions are given. (auth)

5044

SPONTANEOUS FISSION OF Th^{232} AND THE STABILITY OF NUCLEONS. G. N. Flerov, D. S. Klochkov, V. S. Skobkin, and V. V. Terent'ev (Academy of Sciences, USSR). Soviet Phys. (Doklady) 3, 79-80(1958) Jan.-Feb.

A new determination was made of the half life of Th^{232} for spontaneous fission. Increased sensitivity was obtained by increasing the total amount of active substance and by reducing the background. The background was reduced by using a proportional counter as the detector of fission fragments. Special attention was given to the attenuation of the background from spontaneous fission of a possible uranium impurity. To increase the total amount of active material, several counters of the same kind were used. Measurements covering 7000 g-hr yielded not a single act of spontaneous fission. It was concluded that the half life for the spontaneous fission of Th^{232} is greater than 10^{21} yr. (J.S.R.)

5045

THE ACTIVATION CROSS SECTIONS OF Mn^{55}, Cu^{63}, Pd^{108}, AND In^{115} FOR THERMAL NEUTRONS. H. Meister (Max-Planck-Inst. für Physik, Göttingen, Ger.). Z. Naturforsch. 13a, 820-2(1958) Oct. (In German)

Circular disk-shaped foils of the substances to be investigated were activated in a standard geometry with thermal neutrons, and the activation cross section was determined by comparison of the saturation activities measured with a 4π counter. The results with respect to Au^{197} with $\sigma_{act} = 98.7$ b were compared with the values given by Hughes and Harvey in Neutron Cross Sections. (tr-auth)

5046

ABSOLUTE EFFECTIVE CROSS SECTIONS OF THE REACTIONS $K^{39}(n,p)Ar^{39}$ AND $K^{39}(n,\alpha)Cl^{36}$ WITH 2.6-Mev NEUTRONS. G. Lindström and H. Neuert (Physikalischen Staatsinstitut, Hamburg). Z. Naturforsch. 13a, 826-9(1958) Oct. (In German)

An improved n-He^3 coincidence apparatus was used to measure the effective cross sections of the $K^{39}(n,p)Ar^{39}$ and $K^{39}(n,\alpha)Cl^{36}$ reactions at a neutron energy of 2.59 Mev. The values obtained were 45 mb and 36 mb, respectively, with an error of ± 10%. A comparison with the effective cross sections calculated approximately from the continuum theory yielded an effective nuclear radius of $R = 3.65 \times 10^{-13}$ cm for Ar^{39} and $R = 7.27 \times 10^{-13}$ cm for Cl^{36}. (tr-auth)

5047

$Li^7(p,\gamma)$ ANGULAR DISTRIBUTION IN THE 441-kev RESONANCE AND SPIN-ORBIT COUPLING IN Be^8. H. Neuert and Th. Retz-Schmidt (Physikalischen Staatsinstitut, Hamburg). Z. Naturforsch. 13a, 829-32(1958) Oct. (In German)

Investigations of the angular distribution of the $Li^7(p,\gamma)$ radiation show a clear positive anisotropy with $\cos^2\theta$ of several percent. From the measurement of the 17.6-Mev radiation, a spin ratio of approximately 4:1 is obtained for the formation of the Be^8 intermediate state 1+ from the 2 and 1 spins. This is only possible when there is intermediate coupling in the formation of this Be^8 state. The a/K ratio is 2 to 3 according to the calculations of French. (tr-auth)

5048

ELASTIC SCATTERING OF NEGATIVE CHLORINE AND BROMINE IONS BY ARGON, NEON, AND NITROGEN. O. Rosenbaum (Physikalischen Staatsinstitut, Hamburg). Z. Naturforsch. 13a, 838-42(1958) Oct. (In German)

From the energy dependence of the effective cross section of the elastic scattering, conclusions could be made on the force occurring during collision processes. According to the Simons method, the potential curve was obtained corresponding to a charge $V = Kr^{-n}$, in which K and n are derived from the results. At ion energies from 1000 to 4000 ev repulsive energies of one ev appeared. (tr-auth)

5049

THE HALF LIFE OF LONG-LIVED Al^{26}. R. A. Rightmire and T. P. Kohman (Carnegie Inst. of Tech., Pittsburgh). Z. Naturforsch. 13a, 847-53(1958) Oct. (In German)

The specific activity of the long-lived isomeric ground state of Al^{26} was measured, and the half life was determined. The Al^{26} sample was produced by proton irradiation of pure magnesium in the cyclotron of the Oak Ridge National Laboratory, and it was chemically separated carrier-free. The specific activity of a solution of this sample was measured with a 4π Geiger counter, in which a branching ratio of 84.6% to 15.4% between positron emission and electron capture was used. The concentration of the Al^{26} present was determined mass spectrographically by means of the isotope dilution method, in which Al^{27} was used as the diluent. The measurements gave a value of $(7.38 \pm 0.29) \times 10^5$ yr for the half life of the long-lived Al^{26}. (tr-auth)

5050

HELIUM AND NEON AS REACTION PRODUCTS OF COSMIC RADIATION IN IRON METEORITES. H. Wanke and H. Hintenberger (Max-Planck-Inst., Mainz). Z. Naturforsch. 13a, 895-7(1958) Oct. (In German)

The helium and neon content of several iron meteorites was accurately measured. The rare gases were adsorbed on activated carbon at the temperature of boiling nitrogen, and the quantity obtained was determined with a Pirani manometer. A mass spectrographic analysis was then made of the sample. The results are tabulated and show a neon isotopic ratio different from atmospheric neon. (J.S.R.)

5051

LINEAR RELATIONS BETWEEN ENERGY LEVELS IN ATOMIC NUCLEI. F. Everling (Max-Planck-Inst., Mainz). Z. Naturforsch. 13a, 900-2(1958) Oct. (In German)

To show the relationship between the levels of nuclei of equal neutron excess, the mass number A was graphed as a function of $C \times A - B$, where C is an arbitrary constant and B is the binding energies of the re-

spective nuclei in the ground or excited states. In eight cases three or more points, which have equal angular momentum quantum numbers and parity, lie on a straight line. Using various values of C, it was shown that a straight line could be calculated. A brief interpretation of these results is given. (J.S.R.)

5052

NATURAL RADIOACTIVITY OF LEAD-204 AND THE QUESTION OF A NATURAL ACTIVITY OF DYSPROSIUM-156. W. Riezler and G. Kauw (Univ. Bonn, Germany). Z. Naturforsch. 13a, 904-5(1958) Oct. (In German)

A nuclear emulsion was impregnated with lead enriched to 27.0% with Pb^{204}. The track distributions were determined, and a half life of $T = 1.4 \times 10^{17}$ yr was obtained for Pb^{204}. The energy of the alpha particles was measured as E = 2.6 Mev. Similar measurements made with a dysprosium sample containing 13.8% Dy^{156} gave a half life greater than 10^{18} yr and an alpha energy of E = 2.2 Mev. It was possible that the tracks were caused by a samarium impurity. (J.S.R.)

5053

DETERMINATION OF THE NUCLEAR TEMPERATURE OF MANGANESE AND COPPER FROM THE ENERGY SPECTRA OF THE PHOTOPROTONS OF THE REACTIONS Mn(γ,p) AND Cu(γ,p). W. Lohmann (Univ. of Freiburg i. B.). Z. Naturforsch. 13a, 905-6(1958) Oct. (In German)

On the basis of the statistical theory of the nuclear photoeffect, the proton energy is graphed as a function of the linear absorption coefficient to give the nuclear temperature of Mn and Cu. The results $T_{Mn} = 1.0 \pm 0.1$ Mev and $T_{Cu} = 0.87 \pm 0.1$ Mev are compared with the results obtained by other methods. (J.S.R.)

5054

THE RECOIL EFFECT OF THE NEUTRINO IN THE β-DECAY OF He^6. J. Csikai and A. Szalay. (Inst. of Nuclear Physics, Hungarian Academy of Sciences, Debricen, Hungary). Zhur. Eksptl'. i Teoret. Fiz. 35, 1074-5(1958) Nov. (In Russian)

Experiments on neutrino recoil effects from the β decay of He^6 as observed in a cloud chamber are described. (tr-auth)

5055

A RADIOCHEMICAL STUDY OF THE (p, pxn), (p, 4pxn), AND (p, 5pxn) REACTIONS. T. V. Malysheva and I. P. Alimarin (Inst. of Geochemistry and Analytical Chemistry, Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 35, 1103-12(1958) Nov. (In Russian)

A radiochemical investigation of the isotopes of bismuth, mercury, and gold produced in the disintegration of bismuth by 660-Mev protons was studied. A method for quantitative determination of radioisotopes based on L-radiation proposed for isotopes which have undergone elementary capture. The half period of Hg^{193}, which is 4 hours, and E-capture in the gold isomer Au^{193m} were determined by successive extraction of the daughter fractions. On the basis of the dependence of the yields of the reactions (p,xn), (p,4pxn), and (p,5pxn) on the number of emitted neutrons, some conclusions regarding the mechanism of disintegration of complex nuclei by high energy protons are drawn. (tr-auth)

5056

RADIOCHEMICAL INVESTIGATION OF PHOTOFISSION OF Th^{232}. I. A. Vasilev and K. A. Petrzhak (Leningrad Technological Inst.). Zhur. Eksptl'. i Teoret. Fiz. 35, 1135-40(1958) Nov. (In Russian)

Twelve fragments from the photofission of Th^{232} for a peak bremsstrahlung energy of 10 Mev were identified by a radiochemical method. The mass number dependence of the fission product yields was determined. The dependence of the peak-to-valley ratio of the Th^{232} and U^{238} photofission yield curves on the peak bremsstrahlung energy was determined in the energy range from 8 to 14 Mev. Results of calculation of the photofission of thorium and uranium by Fong's method are presented. (tr-auth)

5057

EXCHANGE EFFECTS IN STRIPPING REACTIONS. V. G. Neudachin (Moscow State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 35, 1165-70(1958) Nov. (In Russian)

Formulas for the differential cross sections of the stripping reactions (d,p) or (d,n) were obtained in the Born approximation with account of antisymmetry of the total wave function. The most important case of shell configuration j^{n-1} for the initial nucleus and j^n for the final nucleus is considered. (tr-auth)

5058

HYDRODYNAMIC THEORY OF MULTIPLE PRODUCTION OF PARTICLES IN COLLISIONS BETWEEN FAST NUCLEONS AND NUCLEI. G. A. Milekhin (Lebedev Inst. of Physics, Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 35, 1185-97(1958) Nov. (In Russian)

The three-dimensional problem of divergence of the particles emitted in the collision between a nucleon and nucleus was solved. The distributions in energy, angle, and transverse momenta are investigated with aid of the solution obtained. The error in the final formulas is ~ 20%. (tr-auth)

5059

CASCADE CURVES FOR COPPER. I. P. Ivanenko and B. E. Samosudov. Zhur. Eksptl'. i Teoret. Fiz. 35, 1265-70(1958) Nov. (In Russian)

Electron cascade curves in copper are calculated for primary electron or photon energies $10^7 \lesssim E \lesssim 10^{12}$ ev by the momenta method. The calculation is performed with account of the dependence of the total photon absorption coefficient on energy and of Rutherford scattering of the charged particles. A short analysis of the numerical results is carried out. (tr-auth)

5060

CALCULATION OF THE PHONON PART OF MUTUAL FRICTION IN SUPERFLUID HELIUM. L. P. Pitayevskii (Inst. of Problems in Physics, Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 35, 1271-5(1958) Nov. (In Russian)

The mutual friction in superfluid helium due to scattering of phonons on vortex lines is calculated. It is shown that at a temperature of the order ~ 0.5°K the phonon component of mutual friction becomes comparable with the roton component. (tr-auth)

5061

ON THE THEORY OF THE "SECOND MOMENT" IN THE LANE, THOMAS, AND WIGNER NUCLEAR MODEL. V. M. Agranovich and V. S. Stavinskii. Zhur. Eksptl'. i Teoret. Fiz. 35, 1285-7(1958) Nov. (In Russian)

A mathematical analysis was made of the "second moment," and formulas were derived which show the dependence of the "second moment" on the energy of

excitation E and the number of nucleons in the nucleus. The magnitude of the "second moment" with E = 16 Mev coincides with the magnitude previously postulated for the satisfactory description of large resonance parameters in nuclear reactions. (R.V.J.)

5062

ON THE DIFFRACTION OF SPALLATED LIGHT NUCLEI. A. G. Sitenko and Yu. A. Berezhnoi (Khar'kov State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 35, 1289-91 (1958) Nov. (In Russian)

Calculations were made of integral cross sections of various interaction processes between deuterons and black nuclei with an arbitrary ratio between radii R_d and R. The coulomb interactions were not included in the calculation. (R.V.J.)

5063

MEASUREMENTS OF β-γ CORRELATION OF ORIENTED NUCLEI. A. V. Kogan, V. D. Kul'kov et al. (Leningrad Inst. of Physics and Tech.). Zhur Eksptl'. i Teoret. Fiz. 35, 1295-6(1958) Nov. (In Russian)

Measurements of the β-γ angular correlation for oriented Co^{60} nuclei are made on a specially designed apparatus which permits an increase in the time and improves the statistical precision of the experiment. The data obtained are in good agreement with theoretical calculations developed in the approximation of combined parity conservation. (R.V.J.)

5064

ELASTIC SCATTERING OF π^+ MESONS ON CARBON AT 5 TO 22 Mev. V. G. Kirillov-Ugryumov, L. P. Kotenko, et al. (Lebedev Inst. of Physics, Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret. Fiz. 35, 1300-2(1958) Nov. (In Russian)

The elastic scattering of π mesons on carbon at 5 to 22 Mev was investigated in a 750 cm^3 propane bubble chamber. The chamber was irradiated in a phasotron by a beam of positive π mesons. The energy investigated corresponds to the residual tracks of π mesons in propane from 0.125 to 2 g/cm^2. The π meson was identified according to $\pi \rightarrow \mu \rightarrow e$ decay, with π mesons stopping in the working substance of the chamber. Analysis was made of 5675 tracks. Star production at 5 to 22 Mev was studied. The observed π meson scatterings at 5 to 22 Mev were elastic; few positive meson nonelastic scatterings were observed at these energies. (R.V.J.)

5065

HYPERFRAGMENTS OF σ_K-STARS. B. P. Bannik and S. A. Bunyatov (Joint Inst. of Nuclear Research). Zhur. Eksptl'. i Teoret. Fiz. 35, 1307-8(1958) Nov. (In Russian)

Systematic investigations of photoemulsions irradiated by a K^- meson beam uncovered four incidents of hyperfragment meson decay in 619 σ_K stars. Three of these events were identified, and data on the hyperfragment paths and the paths of particles emitted in the decay are tabulated. (R.V.J.)

5066

ALPHA DECAY OF Bi^{210} ISOMER. S. V. Golenetskii, L. I. Rusinov and Yu. I. Filimonov (Leningrad Inst. of Physics and Tech.). Zhur. Eksptl'. i Teoret. Fiz. 35, 1313-5(1958) Nov. (In Russian)

Studies were made of the long-lived isomer of Bi^{210}, emitting α particles of 4935 ± 20 kev with a $T_{1/2} = 2.6 \times 10^6$ years. The spectrum measured is presented. In addition to the previously observed α particles at 4935 ± 20 kev, two new groups of α particles with energies 4900 ± 10 and 4640 ± 30 kev were found. The relative intensities of the free α transitions are 60, 30, and 10%, respectively. The decay scheme is included. (R.V.J.)

5067

HARD γ RADIATION OF Ag^{110*}. L. V. Gustova, L. P. Timofeeva, and O. V. Chubinskii (Leningrad State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 35, 1317-18(1958) Nov. (In Russian)

A gamma hodoscope was used in studies of Ag^{110*} γ radiation at >1.6 Mev. (R.V.J.)

5068

COULOMB EXCITATION OF HIGH ENERGY NUCLEAR LEVELS IN EVEN ISOTOPES OF TUNGSTEN. D. G. Alkhazov, A. P. Greenberg, et al. (Leningrad Inst of Physics and Tech., Academy of Sciences, USSR). Zhur Eksptl'. i Teoret. Fiz. 35, 1325-34(1958) Dec. (In Russian)

Natural tungsten and samples of tungsten enriched with isotopes of W^{182}, W^{184}, and W^{186} were irradiated with 8.3- to 14.5-Mev α particles. The existence of the following excited states was established: W^{182}, 1.22 Mev; W^{184}, 0.90 Mev; and W^{186}, 0.73 Mev. The reduced transition probabilities to the ground state B(E2) calculated for each of these levels were found to be respectively 0.051, 0.038, and 0.040 (in units of $e^2 \times 10^{-48} cm^4$). The supposition that these levels are of the vibrational type is discussed. (tr-auth)

5069

ON THE RATIOS BETWEEN THE ISOMERIC AND GROUND STATE YIELDS OF Zn^{69} PRODUCED IN VARIOUS NUCLEAR REACTIONS. K. I. Zherebtsova, T. P. Makarova, Yu. A. Nemilov, and B. L. Funstein (Radium Inst., Academy of Sciences, USSR). Zhur. Ekspti'. i Teoret. Fiz. 35, 1355-7(1958) Dec. (In Russian)

The ratio between the amounts of Zn^{69} atoms produced in the isomeric and ground states in the $Zn^{68}(d,p)Zn^{69}$, $Ga^{69}(n,p)Zn^{69}$, and $Ga^{71}(d,\alpha)Zn^{69}$ reactions was studied. In the first reaction the relative yield of the isomeric state first increases with the deuteron energy and then remains constant (about 0.5 of the ground state yield). In the second reaction the ratio is 1.4 for a neutron energy of 14 Mev and in the third reaction about 0.5 for a deuteron energy of 6 to 8 Mev. The results obtained are discussed on basis of various interaction mechanisms (direct interaction and compound nucleus formation). (tr-auth)

5070

MULTI-CHARGED PARTICLES EMITTED IN SPALLATION OF CARBON NUCLEI BY 660 Mev PROTONS. V. I. Ostroumov and Yu. P. Yakovlev (Leningrad Polytechnic Inst.). Zhur. Eksptl'. i Teoret. Fiz. 35, 1358-63(1958) Dec. (In Russian)

Multi-charged particles ejected from a thin polystyrene film bombarded with 660-Mev protons and possessing ranges larger than 20 μ were investigated by means of nuclear emulsions. The effective cross section for production of these particles and their angular and energy distribution were obtained. Measurements of tracks produced by the fragments were employed to determine the charge of particles with ranges above 40 μ in the emulsion. (tr-auth)

5071

HARD γ-RADIATION FROM As^{76}. THE As^{76} DECAY

SCHEME. L. V. Gustova and O. V. Chubinskii (Leningrad State Univ.). Zhur. Eksptl'. i Teoret. Fiz. 35, 1369-79(1958) Dec. (In Russian)

The hard radiation emitted by As^{76} was measured, and six γ lines with energies of 1.21, 1.43, 1.76, 2.08, 2.42, and 2.65 Mev were observed. Their relative intensities were found to be ~500, ~54, 37, 100, and 5.7 to 4.6, respectively. The decay scheme of As^{76} is discussed. It is suggested that the following excited levels exist in the Se^{76} nucleus: 0.56 Mev (2^+); 1.21 Mev (2^+); 1.76 Mev (1.2^+); 2.07 Mev (1.2^+); 2.42 Mev (2.3^+); and 2.64 Mev (3^+). It is also suggested that levels with energies ~1.02 Mev and ~1.26 Mev (0^+ or 4^+) may exist. (tr-auth)

5072

POLARIZATION OF PROTONS ELASTICALLY SCATTERED ON Si^{28} NUCLEI. P. V. Sorokin, A. K. Walter, I. Ya. Malakhov, and A. Ya Taranov (Inst. of Physics and Tech., Academy of Science, Ukrainian SSR). Zhur. Eksptl'. i Teoret. Fiz. 35, 1386-90(1958) Dec. (In Russian)

The polarization of protons scattered through angles of 60, 90, 125, and 150° in the cms and energy interval of 1.6 to 2.2 Mev is determined on the basis of a phase shift analysis of experimental data on the elastic scattering cross section. Polarization at 60 and 90° was measured with the He^4 nucleus used as the analyzer. Within the accuracy of the measurements the calculations and experimental results are in agreement. (tr-auth)

5073

SPIN STRUCTURE OF THE SCATTERING MATRIX FOR REACTIONS INVOLVING γ-QUANTA. V. I. Ritus (Lebedev Inst. of Physics, Academy of Sciences, USSR). Zhur. Eksptl'. i Teoret Fiz. 35, 1485-7(1958) Dec. (In Russian)

A representation of the scattering matrix for reactions involving γ quanta (of the type $\gamma + b \rightarrow a' + b'$ and $\gamma + b \rightarrow \gamma' + b'$) is examined in the form of an expansion in spin operators Q_i which are invariant under rotations. A method of setting up the independent operators Q_i is proposed, and their number is determined. Restrictions which the condition of invariance, under time reversal, imposes on the form and number of operators Q_i are considered. Some examples are given of representation of the S matrix in terms of operators Q_i for reactions in which the spin of particle b and system $a' + b'$ ($\gamma + b' \rightarrow a' + b'$) and the spin of particles b,b' ($\gamma + b \rightarrow \gamma' + b'$) do not exceed unity.

Theory

5074 ML-492

Stanford Univ., Calif. Microwave Lab.

THE KINEMATICS OF GROWING WAVES. P. A. Sturrock. Apr. 1958. 59p.

The problem of distinguishing between amplifying and evanescent waves is presented. These have, in the past, been distinguished by considerations of energy transfer or of the initial and boundary conditions with which a wave must be associated. Both procedures are open to criticism. The problem is interpreted kinematically: the classes of wave functions which a given propagating system may support, without inquiring into the way these disturbances may be set up are investigated. The boundary conditions necessary were not investigated. In this way, the distinction between amplifying and evanescent waves may be made by determining whether a wave function which may be analyzed into "real-frequency" waves may also be analyzed into "real-wave-number" waves. This question may be answered by means of a certain diagram, which may be constructed from knowledge of the dispersion relation. (auth)

5075 NP-7083

Polish Academy of Sciences. Inst. of Nuclear Research, Warsaw.

BETA-DECAYS AND TIME REVERSAL. J. Wrzecionko. June 1958. 13p.

The invariance of weak interactions was investigated without any application of perturbation methods and other simplifying assumptions. The investigations were carried out on the basis of J. Werle's paper, which dealt with the problem of general conditions imposed on the transition matrix by $\hat{P}$, $\hat{C}$, or $\hat{T}$ invariance requirements. The general form of the transition probability for $1 \rightarrow 0$ transitions is investigated. The investigation shows that the invariance under time reversal and Hermitian conditions makes all the time-pseudoscalars vanish. However, the neglect of all final-state interactions is not always sufficient to justify the Hermitian character of the transition matrix. (A.C.)

5076 NYO-2271

Rochester, N. Y. Univ.

COLLECTIVE MOTION IN NUCLEI. J. P. Elliott—M. H. Macfarlane, comp. Sept. 17, 1958. 209p. Contract AT(30-1)-875. $31.80(ph OTS); $9.30(mf OTS).

A compilation from notes taken at a series of lectures delivered by Dr. J. P. Elliott at the Univ. of Rochester is presented. The coupling of angular momenta, the properties of rotation operators, and the algebra of spherical tensor operators are discussed concisely and mathematically. No explicit use is made of the theory of group-representations. Both rotational and vibrational modes are studied, although more emphasis is placed on the former. The desired form of the nuclear hamiltonian is assumed initially, leaving the parameters involved for empirical evaluation. (W.L.H.)

5077 UCRL-8213(Lectures 1-28)

California. Univ., Berkeley. Radiation Lab.

LECTURES ON CONTINUOUS GROUPS AND REFLECTIONS IN QUANTUM MECHANICS GIVEN BY WOLFGANG PAULI AT THE UNIVERSITY OF CALIFORNIA, SPRING TERM, 1958 NO. 1 THRU NO. 28. Notes by R. J. Riddell, Jr. Oct. 1958. 202p. Contract W-7405-eng-48. $3.50(OTS).

5078 NRL-Trans-703

THE EMISSION OF PHOTOELECTRONS FROM THE K-SHELL IN THE DIRECTION OF THE INCOMING γ-RADIATION. (Die Emission von Photoelektronen aus der K-Schale in Richtung der Auslösenden γ-Strahlung.) F. Sauter and H. O. Wüster. Translated by A. Pingell (Naval Research Lab.) from Z. Physik 141, 83-6(1955). 7p.

For the explanation of observations of the photoelectron emission from the K shell in the direction of primary radiation, the quantum mechanical formula, which until now has been calculated only in the first approximation, was re-examined more precisely. In contrast to the approximation formulas considered to date, a finite intensity was found by a more accurate recalculation of the direction of primary radiation. Previous experiments on Au^{198} radiation on Au foils and Co^{60} radiation on Pb foils were rechecked. (W.D.M.)

5079

INVESTIGATION OF THE PROBABLE NATURE OF SOME ATOMIC AND NUCLEAR FORCES. Teofil T. Vescan. Acad. rép. populaire Roumaine, Rev. phys. 2, 175-81(1957). (In French)

A survey is presented of recent work on classical, quantum, and relativistic approaches to definitions of nuclear and atomic forces. 28 references. (J.S.R.)

5080

STEADY-STATE THEORY AT CHICAGO. Richard Schlegel (Michigan State Univ., East Lansing). Am. J. Phys. 26, 601-4(1958) Dec.

In papers published in 1918 and 1925, W. D. MacMillan suggested that the universe maintains a steady state in its large-scale astronomical features, as a result of a balance between matter-to-energy conversion in stellar interiors and creation of atoms from radiant energy in empty space. No mechanism for the atom-creation process in space was suggested. R. A. Millikan used the MacMillan theory as a basis for a theory of the origin of cosmic rays, but in a few years' time accumulating evidence made that theory untenable, and interest in the MacMillan theory then also dropped. Similarities between the MacMillan and Bondi-Gold-Hoyle steady-state theories are noted. (auth)

5081

INVARIANCE PRINCIPLES OF NUCLEAR PHYSICS. G. C. Wick (Brookhaven National Lab., Upton, N. Y.). Ann. Rev. Nuclear Sci. 8, 1-48(1958).

Space inversion (P), time reversal (T), and charge-conjugation (C) are discussed. Some mixed operations obtained by combining P, C, and T are described. A discussion of isotopic spin invariance or charge independence and other related operations is presented. The extension of these ideas to the heavy unstable particles and the related notion of "strangeness" are mentioned. (W.D.M.)

5082

NON-LOCAL STRUCTURE OF FIELD THEORIES WITH NON-RENORMALIZABLE INTERACTION. W. Güttinger (Univ. of São Paulo, Brazil). Nuovo cimento (10) 10, 1-36(1958) Oct. 1.

Quantized field theories of the second kind, the so-called non-renormalizable theories, are investigated. It was recently shown that a number of those theories actually can be renormalized. Field theories of the second kind, pertaining to derivative couplings are shown to possess non-local structure, and the full recoil neutral PS-PV theory in its non-linear form is discussed. The non-localizability of both the unrenormalized and the renormalized theories is due to the fact that the infinite set of topologically independent direct interactions, which characterizes PS-PV theory, is equivalent to a new type of indirect interaction. The non-localizability manifests itself in an indeterminacy in space-time of the light cone. This indeterminacy can be interpreted in terms of a statistical spread in space-time of the positions of two interacting point nucleons over a space-time volume the size of which is determined by the coupling constant $|g|$ of the linear version of PS-PV theory. The length $|g|$ loses its meaning as a coupling in the non-linear formalism in favor of the nucleon mass and plays now the role of a fundamental structure constant. In particular, $|g|$ determines the region in which the equivalence theorem and the $1/r^3$-potential become invalid and repulsive-core potentials begin to act. In virtue of the oscillatory behavior of the non-tempered momentum space operators in the high energy region, positive-definiteness conditions can be established only for regions $|k_\nu^2| \lesssim |1/g^2|$ and $|x_\nu^2| \lesssim |g^2|$. The non-localizability is concentrated in these domains and $|g|$ seems to play the role of the meson Compton wave length. A new interpretation of the non-linear PS-PV theory is suggested. It is conjectured that also β interactions give rise to non-local structures. Multiple propagators are introduced to render the formal coupling constant expansions in theories of the second kind mathematically meaningful without producing non-renormalizable infinities. Arguments are advanced against the mathematical consistency of the concept of creation (annihilation) and localizability of more than one point particle at a single space-time point. (auth)

5083

ON THE UNIVERSAL FERMI INTERACTION. R. J. Blin-Stoyle (Clarendon Lab., Oxford). Nuovo cimento (10) 10, 132-5(1958) Oct. 1.

It is pointed out in connection with a universal Fermi interaction that conservation of axial vector current does not ensure non-renormalization of the axial vector coupling constant for strongly interacting particles. A discussion is given of possible renormalizing processes and their effects. (auth)

5084

ON THE CAUSAL PROPAGATION FUNCTION OF A DIRAC FIELD. E. Ferrari and G. Jona-Lasinio (Univ. of Rome and Istituto Nazionale di Fisica Nucleare, Rome). Nuovo cimento (10) 10, 310-17(1958) Oct. 16.

It is shown that the causal propagation function of a Dirac field can be split in two functions which satisfy a system of two integral equations similar to the Low equations for the symmetrical charged fixed-source meson theory, in the one-meson approximation. These equations are solved and discussed. (auth)

5085

THE APPLICATION OF THE TAMM-DANCOFF METHOD IN THE QUANTUM THEORY OF NON-LINEAR WAVE EQUATIONS. K. Ladányi (Ungarischen Akademie der Wissenschaftern, Budapest). Z. Naturforsch. 13a, 906-8(1958) Oct. (In German)

5086

PHOTON DECAY TO TWO PHOTONS IN A UNIFORM MAGNETIC FIELD. V. G. Skobov (Leningrad Inst. of Physics and Tech.). Zhur. Eksptl'. i Teoret. Fiz. 35, 1315-17(1958) Nov. (In Russian)

A mathematical analysis is made of spontaneous photon decay into two photons in a uniform external field. (R.V.J.)

5087

THE SHAPIRO INTEGRAL TRANSFORMATION. Chou Kuang-Chao and L. G. Zastavenko (Joint Inst. of Nuclear Research). Zhur. Eksptl'. i Teoret. Fiz. 35, 1417-25 (1958) Dec. (In Russian)

An integral transformation is presented which is related to an expansion of the representation by which the wave function of a particle of mass M and spin s transforms into irreducible representations of the proper Lorentz group. (tr-auth)

5088

ON A NEW METHOD IN THE STATISTICAL PERTURBATION THEORY. Chen Chun-sian (Moscow State Univ.).

Zhur. Eksptl'. i Teoret. Fiz. 35, 1518-21(1958) Dec. (In Russian)

A modified version of the statistical perturbation theory is proposed which consists in setting up a model of a dynamical system whose Hamiltonian parametrically contains the inverse temperature. It is shown that for this dynamic system the perturbation theory is equivalent to the ordinary statistical perturbation theory and is much more convenient for practical calculations. (tr-auth)

RADIATION EFFECTS ON MATERIALS

5089 AERE-M and C/R-2751

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

IRRADIATION DAMAGE. Papers Presented at the First Colloquium of the U.K.A.E.A. Diffraction Analysis Conference held at A.W.R.E. on April 2, 1958. J. Thewlis, ed. Nov. 1958. 48p. $1.68(BIS).

The first colloquium was held at Aldermaston on April 2, 1958, and was entitled "Irradiation Damage." Papers were presented on irradiation damage and its significance in reactor design, application of x-ray-diffraction techniques to irradiation damage problems, a diffractometer for study of highly radioactive materials, some applications of small-angle scattering techniques, single crystal techniques for the examination of high specific activity materials, and self-irradiation damage in heavy alpha-active elements. (W.D.M.)

5090 AERE-M and C/R-2751(Sect. 2)

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

IRRADIATION DAMAGE AND ITS SIGNIFICANCE IN REACTOR DESIGN. R. S. Barnes. Sect. 2 [of] IRRADIATION DAMAGE. Papers Presented at the First Colloquium of the U.K.A.E.A. Diffraction Analysis Conference held at A.W.R.E. on April 2, 1958. 15p.

Radiation damage in solids consisting of electronic displacements, atomic displacements, and impurity effects is briefly described. It is shown how the damage manifests itself in various components of the Calder Hall type of reactor. Components discussed include moderator, structural materials, fuel elements, and control rods. (W.D.M.)

5091 AERE-M and C/R-2751(Sect. 3)

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

THE APPLICATION OF X-RAY DIFFRACTION TECHNIQUES TO IRRADIATION DAMAGE PROBLEMS. B. T. M. Willis. Sect. 3 [of] IRRADIATION DAMAGE. Papers Presented at the First Colloquium of the U.K.A.E.A. Diffraction Analysis Conference held at A.W.R.E. on April 2, 1958. 7p.

The possible changes in the x-ray-diffraction pattern of a crystal as a result of irradiation are listed, and various models for the damaged structure are considered. It is shown on the basis of these models how the diffraction effects can arise and what kind of information concerning the damage can be deduced from interpretations using these models. Experimental results to date are discussed. (W.D.M.)

5092 AERE-M and C/R-2751(Sect. 4)

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

AN X-RAY DIFFRACTOMETER FOR THE STUDY OF HIGHLY RADIOACTIVE MATERIALS. J. Adam. Sect. 4 [of] IRRADIATION DAMAGE. Papers Presented at the First Colloquium of the U.K.A.E.A. Diffraction Analysis Conference held at A.W.R.E. on April 2, 1958. 5p.

The instrument described was built at Harwell for work on flat metallurgical samples which were irradiated in various reactors. The principle design of the diffractometer is illustrated. The x-ray beam diffracted by the sample is reflected by a curved quartz crystal monochromator into the counter. (W.D.M.)

5093 AERE-M and C/R-2751(Sect. 5)

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

SOME APPLICATIONS OF THE SMALL-ANGLE SCATTER TECHNIQUE. R. E. Smallman and K. H. Westmacott. Sect. 5 [of] IRRADIATION DAMAGE. Papers Presented at the First Colloquium of the U.K.A.E.A. Diffraction Analysis Conference held at A.W.R.E. on April 2, 1958. 13p.

In metallurgy, precipitated particles afford the most common source of scattering, but other heterogeneities such as dislocations, vacancies, and cavities also give rise to small-angle scattering. An account is given of a few examples where the technique can be usefully applied to a better understanding of small-angle scattering from LiF, small gas bubbles, cold work, and scattering due to alloying and quench and irradiation hardening. (W.D.M.)

5094 AERE-M and C/R-2751(Sect. 6)

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

SINGLE CRYSTAL TECHNIQUES FOR THE EXAMINATION OF MATERIAL OF HIGH SPECIFIC ACTIVITY. E. Wait. Sect. 6 [of] IRRADIATION DAMAGE. Papers Presented at the First Colloquium of the U.K.A.E.A. Diffraction Analysis Conference held at A.W.R.E. on April 2, 1958. 2p.

The techniques described were developed for an x-ray study of radiation damage by fission products in fissionable materials of interest to the ceramic fuels program. The advantages of the single crystal methods over the powder technique are discussed. Crystal mounting and experimental procedures are described. (W.D.M.)

5095 AERE-M and C/R-2751(Sect. 7)

United Kingdom Atomic Energy Authority. Research Group. Atomic Energy Research Establishment, Harwell, Berks, England.

SELF-IRRADIATION DAMAGE—THE DISPLACEMENT OF ATOMS IN THE ALPHA-ACTIVE HEAVY ELEMENTS. R. W. M. D'Eye. Sect. 7 [of] IRRADIATION DAMAGE. Papers Presented at the First Colloquium of the U.K.A.E.A. Diffraction Analysis Conference held at A.W.R.E. on April 2, 1958. 3p.

Some calculations are given of the number of atoms displaced by radiation damage in compounds of alpha-active isotopes of short half life. The place of such compounds in studies of radiation damage is discussed. Compounds of the alpha-active heavy elements undergo

radiation damage by collision processes both with the alpha particle and with the heavy recoiling nucleus. These calculations show that the prime cause of damage in these compounds is due to the heavy recoiling nucleus. (W.D.M.)

5096 ANL-4952(Del.)
Argonne National Lab., Lemont, Ill.
A SUMMARY AND BIBLIOGRAPHY OF SOME RESEARCH ON RADIATION DAMAGE IN CERAMIC MATERIALS PERFORMED AT THE ARGONNE NATIONAL LABORATORY. W. Primak. Mar. 4, 1953. Decl. with deletions June 18, 1958. 13p. Contract W-31-109-eng-38. $3.30(ph OTS); $2.40(mf OTS).

The susceptibility of certain "ceramic" substances to extreme radiation damage (such as that observed in graphite) as indicated by changes in dimensions and heat content is discussed in terms of the experimental evidence which is available. (auth)

5097 NP-7094
Battelle Memorial Inst. Radiation Effects Information Center, Columbus, Ohio.
THE EFFECT OF NUCLEAR RADIATION ON SEMICONDUCTOR DIODES. Technical Memorandum No. 6. Dec. 31, 1958. 18p. Project No. 2133. Contract AF33(616)-5171.

Satisfactory equipment performance requires design allowances for diode parameter changes resulting from transient, semipermanent, and permanent effects induced by radiation. It appears that the equipment designer should employ the widest possible tolerance limits in order that the equipment will operate satisfactorily for the desired lifetime. One must be aware of the nature of the various diode parameter changes resulting from radiation exposure in order that tolerance trade-off can be fully utilized. Thorough consideration must be given to the effects of radiation exposure on the complete equipment of which the diode is a part. Illustrations show the effect of radiation on the forward and reverse characteristics of a number of diodes. In both germanium point-contact and p-n junction diodes, forward conductance decreases and reverse conductance increases as a function of both neutron and gamma radiation. Though both forward and reverse conductances decrease with increasing radiation dose in silicon point-contact diodes, the reverse conductance increases and forward conductance decreases as a function of radiation dose in p-n junction silicon diodes. Semiconductor diode behavior under nuclear radiation is summarized. 30 references. (auth)

5098 NP-7109
Purdue Univ., Lafayette, Ind.
NUCLEON IRRADIATION OF SILICON SEMIDONDUCTORS (thesis). Thomas Anthony Longo. Aug. 1957. 89p.

The object of this work was to investigate the effects of nucleon irradiation on the electrical and optical properties of silicon. After fast neutron irradiation, the inverse temperature dependence of the logarithms of Hall coefficient and resistivity of both n-type and p-type single crystal silicon samples indicated that intrinsic behavior was approached in each sample. A 1.75-μ peak in the optical absorption coefficient was observed. This peak is believed to result from optical excitation rather than ionization of an introduced defect level since it is not accompanied by an increase in photoconductivity. Appreciable photoconductivity was observed beyond the fundamental region to about 1.45 μ. Annealing experiments were continued on a polycrystalline p-type silicon sample which had been previously irradiated with fast neutrons. After annealing at temperatures ranging from 150 to 250°C, the slopes of the logarithms of Hall coefficient and resistivity vs. $10^3/T$ decreased, suggesting the rearrangement of introduced defect levels accompanying annealing. During annealing, the absorption peak at 1.75-μ gradually disappeared and an absorption tail extending past 30-μ increased. Quantitative information was needed in order to establish the nature and numbers of the defects introduced by the irradiations. Therefore, n- and p-type silicon were irradiated with 9.6-Mev deuterons. The Hall coefficient and conductivity of degenerate and non-degenerate samples were measured as a function of irradiation. The carrier concentrations of all samples were reduced by irradiation. For n-type degenerate samples, the change in carrier concentration with flux $\Delta n/\phi = -670$ electrons cm^{-1} per deuteron and for p-type degenerate samples $\Delta P/\phi = -750$ holes cm^{-1} per deuteron. These compare favorably with a calculated rate of defect pair introduction $\Delta N/\Delta\phi = 775$ defect pairs cm^{-1} per deuteron, with one carrier removed per pair. This work supports the belief that the introduction of close vacancy interstitial pairs is the predominant effect of irradiation. The changes of carrier concentration with flux decreased rapidly as the Fermi level moved into the forbidden band. The interstitial states appeared to be at 0.025 ev from conduction band and the vacancy states at 0.055 ev from the valence band. For heavy irradiations, the removal rates were lower in the degenerate and higher in the non-degenerate regions than what was observed for smaller irradiations. This suggested clustering of defects and the states associated with these clusters appeared to be introduced deep in the forbidden gap. (auth)

5099 NP-7198
Battelle Memorial Inst. Radiation Effects Information Center, Columbus, Ohio.
THE EFFECT OF NUCLEAR RADIATION ON MAGNETIC MATERIALS. Technical Memorandum No. 12. Dec. 31, 1958. 15p. Project No. 2133. Contract AF33(616)-5171.

Structure-sensitive properties of magnetic materials, such as permeability, remanence, and coercive force, are affected by nuclear irradiation. These effects are most serious in the nickel–iron alloys, and irradiations to 10^{17} fast n/cm^2 are sufficient to cause drastic changes in their magnetic properties. The properties of silicon irons, aluminum irons, 2V Permendur, and several ferrites are not seriously affected up to 10^{17} fast n/cm^2. Magnetic amplifiers have been operated successfully up to 10^{15} fast n/cm^2 with no damage observed in the core materials. A list of current programs that the Radiation Effects Information Center has identified as being related to radiation effects on magnetic materials is included. (auth)

5100 NP-7199
Battelle Memorial Inst. Radiation Effects Information Center, Columbus, Ohio.
MONTHLY ACCESSION LIST NO. 19 [ON RADIATION EFFECTS DATA]. Jan. 15, 1959. 17p. Project No. 2133. Contract AF33(616)-5171.

5101 WADC-TN-58-86
Wright Air Development Center. Aircraft Lab., Wright-Patterson AFB, Ohio.
EVALUATION OF AN AIRCRAFT TIRE IRRADIATED

IN SYSTEMS PANEL TEST NUMBER 2. James H. Heil. Mar. 27, 1958. 15p. Project title: LAUNCHING, GRAPPLING, AND ALIGHTING SYSTEMS FOR SPACECRAFT. Task title: DEVELOPMENT OF TIRES TO WITHSTAND NUCLEAR RADIATION. (AD-151118).

The purpose of the tests was to evaluate the suitability of an aircraft tire and inner tube irradiated in Systems Panel Test No. 2 (SPT #2). The aircraft tire and inner tube irradiated in SPT #2 performed satisfactorily in dynamometer flywheel tests. A burst test of the irradiated tire showed a small decrease in the burst strength, but the tire still satisfied the specification minimum burst strength requirements. The evaluation of the materials in the irradiated tire revealed a small decrease in the tensile strength of the nylon cords used in the tire carcass. This decrease in cord tensile strength was largely due to the radiation. No change was detected in the rubber materials of the tire. Present aircraft tires could provide from one to five actual landings when subjected to radiation of the level of SPT #2. (auth)

5102 CEA-tr-R559

ETUDES DE QUELQUES PROPRIÉTÉS DU POLYÉTHYLÈNE SOUMIS À L'ACTION DES RAYONS γ. (Study of Some Properties of Polyethylene Exposed to Gamma Rays.) B. I. Sagine, A. M. Lobanov, A. L. Goldenberg, T. N. Sarminskaya, I. A. Marakhonov, and S. P. Kabine. Translated by B. Vinogradoff from Zhur. Tekh. Fiz. 28, 1991-8(1958). 16p.

Studies of infrared spectra, x-ray spectra, and mechanical and dielectric breakdown of solid blocks of polyethylene under irradiation are described. At doses up to 80×10^6 r (from Co^{60}) reticulations and macromolecular structure changes are produced which change the values of mechanical and dielectric breakdown. (T.R.H.)

5103

THE STABILITIES OF ION-EXCHANGE RESINS IN AQUEOUS SOLUTION ACTED ON BY Co^{60} γ-RAYS. Tsuan Man-Wei, A. I. Chernova, and M. A. Proskurnin. Atomnaya Energ. 5, 573-5(1958). (In Russian)

The effects of Co^{60} γ radiation on the changes in the physico-chemical properties of ion exchange resins in aqueous solutions were investigated. Results are presented in tables and graphs. The dependence of resin dissolution on the radiation dose was found, and rapid changes were observed in the statistical capacity of the resins for sodium and uranyl ions. High radiation doses did not alter the capacity for sodium ions, while the uranyl ion capacity considerably increased. The presence of sodium chloride considerably slowed the process of resin dissolution. (R.V.J.)

5104

USE OF A RADIATION-CALORIMETER IN MEASUREMENT OF STORED ENERGY IN IRRADIATED GRAPHITE. M. S. Wechsler, R. R. Coltman, et al. (Oak Ridge Natl. Lab., Tenn.). J. Appl. Phys. 30, 42-5 (1959) Jan.

The measurement of the stored energy of graphite taken from the lattice of the ORNL Graphite Reactor is described. The release of 26 cal/g of stored energy was observed upon heating to 218°C. The measurements were made using a new technique that depends upon the transfer of heat by radiation from the walls of the calorimeter to the sample. (auth)

5105

RADIATION STABILITY OF ORGANOPHOSPHORUS COMPOUNDS. R. M. Wagner, E. M. Kinderman, and L. H. Towle (Stanford Research Inst., Menlo Park, Calif.). Ind. Eng. Chem. 51, 45-6(1959) Jan.

Radiation damage to organophosphorus compounds used as extractants for uranium and plutonium can markedly influence process efficiency. Small changes in structure are important. (auth)

5106

DEGRADATION OF PLASTICIZED P.V.C. COMPOSITIONS UNDER HIGH-LEVEL GAMMA RADIATION. H. Wells and I. Williamson (Atomic Energy Research Establishment, Harwell, Berks, Eng.). Nuclear Power 4, 123-4(1959) Jan.

A series of tests was carried out on plasticized polyvinyl chloride samples to determine quantitatively the effect of formulation in preventing or retarding degradation. The results indicate that polyvinyl chloride compounds plasticized with tritolyl phosphate show less physical deterioration under gamma radiation than the other plasticizers tested. (W.D.M.)

5107

GAMMA-RADIATION EFFECTS ON POLYETHYLENE PROPERTIES. B. I. Sazhin, A. M. Lobanov, et al. (High Polymers Inst., Leningrad). Zhur. Tekh. Fiz. 28, 1991-8(1958) Sept. (In Russian)

Results are presented of studies of the infrared spectra, x-ray pictures, and mechanical and dielectric losses of polyethylene exposed to γ radiation. Macromolecular merging and changes in the structure were observed at 80×10^6 r, which caused mechanical and dielectric losses. (tr-auth)

RADIOACTIVE WASTE

5108 IDO-14446

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

ATTRITION TEST ON CALCINED IDAHO CHEMICAL PROCESSING PLANT WASTE. Paul N. Kelly. Dec. 1, 1958. 6p. Contract AT(10-1)-205. $0.50(OTS).

An attrition test made on calcined simulated Idaho Chemical Processing Plant waste showed an excessive fines build-up. Calcine below 60 Tyler mesh increased from 2.5 to 19.1 percent in a 189-day test. The calcine was circulated in a manner to approximate a proposed cooling scheme. (auth)

5109

RADIOACTIVE FALL-OUT IN THE AREAS AROUND LENINGRAD. V. P. Shvedov, V. A. Blinov, et al. Atomnaya Energ. 5, 577-82(1958). (In Russian)

Results of fall-out monitoring in the vicinity of Leningrad for the years 1954 to June 1, 1958, are presented in tables and graphs. A diagram of cumulative fall-out density around Leningrad is included. (R.V.J.)

REACTORS

General

5110 AD-157595

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

THE AIR FORCE INSTITUTE OF TECHNOLOGY

SUBCRITICAL ASSEMBLY (thesis). James Douglas Butt. Mar. 1958. 60p.

The Air Force Institute of Technology heterogeneous subcritical assembly consists of three concentric aluminum tanks mounted on a graphite pedestal. Water in each of the tanks serves as moderator, reflector, and shield. A Po–Be neutron source is positioned at any point on the assembly centerline by a remotely operated electromechanical control mechanism. Preliminary instrumentation consists of a BF_3 slow neutron detector, signal amplifiers, and a scalar. (W.D.M.)

5111 AECU-3937

General Electric Co. General Engineering Lab., Schenectady, N. Y.

LOCATION OF MULTIPLE REACTOR FUEL ELEMENT FAILURES BY THE DELAYED NEUTRON SAMPLING METHODS, WITH APPLICATION TO S3G. R. A. Dewes. Nov. 25, 1958. 21p. (58-GL-321). $4.80(ph OTS); $2.70(mf OTS).

General equations are derived for multicell, recirculating reactors having one or two passes; these equations give the relation between failure size in a given fuel cell relative to the total failure size present in the reactor and the delayed neutron activities observed in coolant samples extracted from the exit of each fuel assembly. The equations are then applied to the S3G reactor, and expected results and conclusions are presented. The equations presented are also valid for determining relative contamination factors. By simply redefining the quantity S_i to be equal to the amount of contamination in the i_{th} location (fuel cell), the analysis follows precisely as presented. (auth)

5112 ANL-5766

Argonne National Lab., Lemont, Ill.

A GAMMA-RAY ATTENUATION METHOD FOR VOID FRACTION DETERMINATIONS IN EXPERIMENTAL BOILING HEAT TRANSFER TEST FACILITIES. H. H. Hooker and G. F. Popper. Nov. 1958. 40p. Contract W-31-109-eng-38. $1.25(OTS).

Gamma rays emanating from a radioactive source are beamed through and are attenuated by steam–water mixtures contained in a simulated reactor flow channel. The emergent radiation is detected by a scintillation crystal-photomultiplier tube assembly. An expression is developed which yields the void fraction when the detector output with the channel empty, filled with water, and containing the mixture in question is known. The principal sources of errors inherent in the method are analyzed and their magnitudes computed for a specific test facility. With a uniform bubble distribution in this facility, the maximum possible error in void fraction is approximately ± 0.03. The method is also applied to three idealized preferential phase distributions simulated in Lucite. However, the large discrepancy between calculated and measured void fractions illustrates the need for more refined experimental techniques where non-uniform distribution of voids are encountered. Such techniques are being developed. (auth)

5113 ANL-5940

Argonne National Lab., Lemont, Ill.

EBR-II FUEL IRRADIATION FACILITIES. R. J. Schiltz, J. H. Monaweck, and E. S. Sowa. Nov. 1958. 18p. Contract W-31-109-eng-38. $0.75(OTS).

Two irradiation facilities, designed for installation within tubular fuel elements, and peripheral experimental thimbles in the CP-5 reactor core are described. Both units are cooled internally by natural convection of D_2O and feature an inherent variable temperature-control system which permits ~ ±75-degree central metal temperature variation for a given heat-transfer rate. Heat-transfer rates ranging from 10 tkw (fuel) to 15 tkw (thimble) are possible. External cooling is provided by the reactor D_2O moderator. Although designed primarily to simulate an operational environment for the evaluation of EBR-II prototype fuel elements, both facilities can be utilized for the irradiation of other fuel materials of interest, consistent with the internal geometry of each unit. Complementary information includes thermal analyses and mock-up tests pertinent to the ultimate design. (auth)

5114 ANL-5941

Argonne National Lab., Lemont, Ill.

EBWR TURBINE BLADE FAILURE. Summary Report. J. M. Harrer and E. A. Wimunc. Nov. 1958. 22p. Contract W-31-109-eng-38. $0.75(OTS).

This is a summary report on the failure of the EBWR turbine blade. It includes a description of the turbine shutdown sequence, the investigation into the cause of vibration, the disassembly of turbine, and observations and conclusions concerning the cause of the blade failure. The cause of failure was traced to a fault in the holding fixture used during the machining operation. There was no indication that any adverse effect on the turbine blades resulted from the fact that the steam came from a direct-cycle boiling water nuclear reactor power source. (auth)

5115 APEX-371

General Electric Co. Aircraft Nuclear Propulsion Dept., Cincinnati.

MONTE CARLO RESEARCH SERIES: MONTE CARLO PROGRAM FOR A LINEAR REACTOR WITH VOID GAPS. J. R. Beeler, Jr., R. H. Nelson, and P. A. Dyer. Nov. 13, 1957. 30p. (XDC-57-11-121). $4.80(ph OTS); $2.70 (mf OTS).

A Monte Carlo calculation for computing the diffusion coefficient and diffusion length in a linear system, with alternate solid and void segments is described. The program code is for the IBM 704. (auth)

5116 APEX-388

General Electric Co. Aircraft Nuclear Propulsion Dept., Cincinnati.

REACTOR FUSE PROPELLANTS AND CONFIGURATIONS. R. J. Spera, S. N. Stilwell, and W. Lamond Weiss. Dec. 1956. 30p. Contracts AF-33(600)-38062 and AT(11-1)-171. $1.00(OTS).

Results are compiled from a series of experimental tests of three types of propellants for reactor safety fuses and various configurations of the fuse. Compressed gas, explosive gases, and solid chemical propellants are discussed; the latter proved to be the best. A symmetrical annular fuse configuration was found to be best when compared with the offset type, the supported-rupture-disk type, and the GE-ANPD original developmental type fuse. (auth)

5117 CEA-695

France. Commissariat à l'Énergie Atomique, Paris.

DÉTERMINATION DES CONTRAINTES DANS UNE GAINE LIÉE A UN BARREAU. (Determination of Stresses in a Sheath Connected to a Rod.) J. L. Bernard and M. Gauthron. 1957. 23p.

The stresses in a sheath bonded to a fuel rod were studied. A qualitative and analytical study of the variations of the stress was theoretically presented. The instruments to be used in the experimental study were

described and some preliminary data were given. (J.S.R.)

5118 CEA-784
France. Commissariat à l'Énergie Atomique, Paris.
LA COEXTRUSION APPLIQUEE À LA RÉALISATION D'ÉLÉMENTS COMBUSTIBLES MASSIFS OU DISPERSES. (Coextrusion Applied to the Construction of Fuel Elements in Solid or Powder Form.) R. Montagne and L. Meny. [1957]. 33p.

In the first part of the report a fabrication process for solid fuel elements is described. The simultaneous extrusion of both fuel and can gives good bonding. The bonding can be improved by a thermal treatment which causes diffusion. The tests made on the coextruded elements are described. In the second part, the fabrication of powdered fuel elements is studied, an Al–30 wt. % U alloy with 20% enrichment being used. The dimensions of the element are as follows: exterior diameter, 30 mm; interior diameter, 24 mm; length of the core, 300 mm; and sheath thickness, 0.4 mm. The method of fabrication consists of pressing the mixed uranium and aluminum powders in an aluminum can and extruding at 500°C. One end of the fuel element is sheathed directly by extrusion, and the other, by welding an aluminum plug. The results of the first tests are given. (tr-auth)

5119 CEA-792
France. Commissariat à l'Énergie Atomique, Paris.
PUISSANCE DE LA PLAQUE D'URANIUM DE NAÏADE. (Power of the Uranium Plate of Naïade.) P. Lafore, J. P. Millot, and J. Rastoin. Aug. 1957. 21p.

By knowing the incident current of thermal neutrons, the sources of fast neutrons inside the plate are deduced. The fast flux leaving the plate is then determined. Isotropically, 0.57 fast neutrons come out for each incident thermal neutron. The incident thermal flux is measured by means of manganese detectors on reaching the plate and estimated from the flux leaving the graphite. The fast flux coming out is measured with dose-rate films. The absorption of the fast flux in the swimming-pool water is measured. The uranium plate is equivalent to a disk placed at its surface emitting isotropically 3.8×10^7 fast neutrons per cm^2/sec, when ZOE operates at 100 kw. This result is valid to about 10%. (auth)

5120 CEA-793
France. Commissariat à l'Énergie Atomique, Paris.
ETUDE DES GAMMA DE NAÏADE. (Study of γ's in Naïade.) J. P. Millot and J. Rastoin. Feb. 1958. 13p.

Following a study of gamma sources, the flux of gammas of different energies in the swimming pool is investigated. The biological dose can thus be obtained by calculation and compared with the results given by photographic plates. The influence of photoneutrons is estimated by calculation, and research is being carried out on their influence on the thermal neutron flux curve on the axis of the uranium plate, with the plate emitting neutrons and with the plate protected by boral. (auth)

5121 CEA-794
France. Commissariat à l'Énergie Atomique, Paris.
ETUDE EXPERIMENTALE DE LA PILE EL 3. (Experimental Study of the Pile EL3.) 1958. 64p.

The results of two months' experiments, carried out at low power following the first divergence (July 4, 1957) are presented. These experiments dealt with the following points: comparison of experimental and calculated values of the critical size; effects due to the introduction of absorbing materials into the principal experimental facilities; flux distribution measurements especially in these facilities; calibration of safety, control, and compensating rods; and determination of the average life of the neutrons. (auth)

5122 CF-58-11-98
Oak Ridge National Lab., Tenn.
SURVEY OF THE STATIC NUCLEAR CHARACTERISTICS OF SMALL ONE-REGION SLURRY REACTORS: PART II. B. E. Prince. Nov. 26, 1958. 9p. Contract W-7405-eng-26. $1.80(ph OTS); $1.80(mf OTS).

The critical U^{235}-to-thorium ratios in single-region slurry reactors were calculated for various ratios of H_2O to D_2O in the moderator. Reactors studied had diameters between 3.5 and 5.5 ft (bare sphere diameters), temperatures of 280°C, and slurry concentrations between 50 and 900 g thorium/liter. It was found that the addition of small amounts of H_2O to D_2O (< about 20%) causes the critical mass ratio to become smaller and the minimum ratio for a given reactor size to occur at higher thorium concentrations. For example, in a 4.5 ft reactor the minimum ratio was 0.13 g U^{235}/g Th at the conditions of 150 g thorium/liter and 99.8% D_2O in the moderator. If the moderator was 20% H_2O, the minimum ratio was 0.04 g U^{235}/g Th at the concentration of 500 g thorium/liter. (auth)

5123 CF-58-12-10
Oak Ridge National Lab., Tenn.
EVALUATION OF THE IODINE VAPOR-FISSION GAS ADSORPTION TRAPS FOR ORR-705 CAPSULE EXPERIMENT, GCPR CAPSULE IRRADIATION PROGRAM. R. E. Adams and W. E. Browning. Dec. 23, 1958. 18p. Contract [W-7405-eng-26]. $3.30(ph OTS); $2.40(mf OTS).

The activated charcoal adsorption traps designed for use in the ORR irradiation of the 705 capsules, GCPR Capsule Irradiation Program, were evaluated under several sets of proposed operating conditions, and the adsorption efficiency for iodine vapor and fission gases was determined. Even under the more improbable operating conditions, the probability of releasing sufficient quantities of radioiodine, radiokrypton, or radioxenon to produce an atmospheric radiation hazard is considered to be low. (auth)

5124 CF-58-12-15
Oak Ridge National Lab., Tenn.
SURVEY OF THE STATIC NUCLEAR CHARACTERISTICS OF SMALL ONE-REGION SLURRY REACTORS. PART III. B. E. Prince and M. P. Lietzke. Dec. 8, 1958. 33p. Contract [W-7405-eng-26]. $6.30(ph OTS); $3.00(mf OTS).

A summary is given of computed criticality parameters for U^{235} fueled, spherical ThO_2–H_2O–D_2O reactors smaller than 3 ft in diameter and moderated with H_2O–D_2O mixtures above 20% in H_2O. Thorium concentrations were varied between 200 and 1000 g/liter, and the temperature range was 20 to 200°C. The parameters calculated were critical uranium-to-thorium ratios and the reactivity coefficients of temperature, void, and slurry concentration. As a typical example, a 2.5-ft reactor, moderated with an 80% D_2O–20% H_2O mixture, has a minimum critical mass ratio and a maximum critical temperature at about 500 g Th/liter. These values were about 0.08 g U^{235}/g Th and 200°C, respectively. (auth)

5125 CF-58-12-36
Oak Ridge National Lab., Tenn.
CRITICAL CONCENTRATION DATA FOR HRT-TYPE

REACTORS MODERATED BY D_2O-H_2O MIXTURES. R. Chalkley. Dec. 15, 1958. 6p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Studies were made concerning the smallest core diameter and the most appropriate D_2O-H_2O composition ratio which would permit criticality in an HRT-type reactor; the fuel solution should contain no more than 10 g U/liter at 280°C. For the present core diameter of 32 inches (two-region operation), it was found that an addition of 10% light water to the moderator would reduce the critical concentration from 9.2 to about 7.8 g U/liter at 280°C (concentrations in g total U/liter, based on U of 93.4% enrichment). The smallest core diameter for which the reactor would remain critical with less than 10 g U/liter is about 29 inches. This occurred with a moderator composition of about 85% D_2O. (auth)

5126 IDO-16425

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

SPERT III HAZARDS SUMMARY REPORT. F. Schroeder. Jan. 14, 1958. 63p. Contract AT(10-1)-205. $1.75(OTS).

Spert III will be a heterogeneous, light-water-cooled and -moderated reactor, designed for operation at pressures up to 2500 psi and temperatures up to 670°F. The facility will be used for the performance of basic reactor kinetic studies designed to provide information for the advancement of pressurized-water, power-reactor safety and technology. This report discusses the major hazards present in the operation of this facility, the precautions to be taken to reduce the probability of an accident, and the consequences of the maximum possible accident. Brief descriptions of the Spert III design and the site location are also presented. It is concluded that the proposed method of operation and the site location make possible the operation of the Spert III facility without hazard to the general public. (auth)

5127 IDO-16455

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

PLUTONIUM SYSTEM STUDY WITH AN APPLICATION TO THE MTR. W. B. Lewis and G. D. Marshall. Nov. 20, 1958. 27p. Contract AT(10-1)-205. $1.00 (OTS).

Enriched plutonium as supplied for reactor fuel generally contains appreciable amounts of isotopes other than Pu^{239}. In order to estimate their effects on reactor behavior, various initial concentrations of Pu^{239}, Pu^{240}, and Pu^{241} have been considered using a simplified approach. In the first part, a constant thermal neutron flux and uniform burnout was assumed. Only thermal cross sections have been used with the neglect of the resonances in Pu^{239} and Pu^{240}. The ratio Σ_f/Σ_a for a plutonium system has been obtained as a function of time for three initial weight percentages of Pu^{239}, Pu^{240}, and Pu^{241}; 50-50-0, 35-65-0, and 20-80-0. It is found that this ratio begins to increase between the plutonium mixtures of 35-65-0 and 20-80-0. This means that the reactivity is aided by the growth of fissionable Pu^{241} from the other two isotopes, primarily as a first order product of Pu^{240}. The number of fission neutrons per thermal neutron absorbed, η, for a system initially containing only Pu^{239} and Pu^{240} has been plotted as a function of Pu^{239} weight percentage. A simulated reactor has been "run" through several cycles with an initial composition of 100-0-0. The N value of Pu was taken to be 10^{20} nuclei/cm^3 for the first cycle. Fuel processing for the successive cycles involved only the removal of fission products with increasing density to provide sufficient excess reactivity. The loss in reactivity due to initial presence of Pu^{240} in the plutonium fuel for the MTR has been calculated. Here account has been taken of the 1 ev Pu^{240} resonance and thermal flux depression in the fuel plates. Three values of the mass of plutonium per fuel element and three values of initial fraction of Pu^{240} have been considered. The reactivity loss ($-\delta k/k$) increases with increasing mass and with increasing fraction. For the present predicted MTR plutonium loading of 152 gms/assembly, an estimate of the initial group shim rod position has been made considering 4.5% Pu^{240} to be present initially. (auth)

5128 IDO-16471

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

TRANSIENT RESPONSE OF THE ETR PRIMARY WATER TEMPERATURE CONTROLLER. W. J. Byron and S. R. Gossmann. Nov. 14, 1958. 13p. Contract AT(10-1)-205. $0.50(OTS).

A rigorous analysis of the ETR with temperature feedback demanded the investigation of a separate loop whose function it is to keep the reactor inlet water temperature constant. It is to accomplish this by regulating the secondary water flow. In IDO-16448, Stability Analysis of the ETR With Reactivity Feedback Through the Temperature Coefficient by S. R. Gossmann, the problems of the stability analysis of the ETR would have been impossible if the present experiment had not been done, since there were no data quickly available on the transient or frequency responses of the components of this loop. As the report describes, the system did not lend itself to the frequency method. The transient response could be easily measured. The experiment and analysis are presented with the resulting transfer function (derived from the transient response) developed in the form used in IDO-16448. (auth)

5129 IDO-16501

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

ETR CONTROL ROD TEST FACILITY. E. S. Brown, J. H. Rainwater, and E. O. Smith. June 2, 1958. 87p. Contract AT(10-1)-205. (PTR-309). $13.80(ph OTS); $4.80(mf OTS).

Subsequent to the original tests of the control rod drive mechanism for ETR, many changes in materials and design were made. As a result it was decided to erect a test facility at the ETR to try out the revised control rod system. It was the object of these tests to determine the operability and durability of the control rod system, to establish the hydraulic characteristics of the control rod, and to obtain information for the maintenance of the ETR control system. The tests revealed that the design of the control rod was inconsistent with required performance criteria. The test facility was used to develop a more acceptable control rod. (W.D.M.)

5130 NP-7135

Brussels. Centre d'Etude de l'Energie Nucléaire.

INTERPRETATION DES EXPERIENCES CRITIQUES SUR BR-1. EVALUATION DU LAPLACIEN MATERIEL. (Interpretation of Critical Experiments on BR-1. Evaluation of the Laplacian.) J. P. Lagnaux. July 23, 1958. 13p.

The value of the material Laplacian was determined for six loadings of BR-1 by two methods. A value of $1.248 \pm 0.002 \times 10^{-4}$ is given. (T.R.H.)

5131 NP-7136
Brussels. Centre d'Étude de l'Énergie Nucléaire.
EMPLOI DE BARREAUX A AILETTES EN MAGNOX DE DIAMETRE REDUIT DANS BR-1. (Use of Rods with Magnox Fins of Reduced Diameter in the BR-1.)
J. Juliens and P. De Myttenaere. May 22, 1958. 19p.

Investigation of a reloading of BR-1 with fuel elements with variable diameter and finned magnox cladding is described. A thermal flux increase of 60% and fast flux increase of 45% were found. Thermal and nuclear considerations of this loading led to the recommendation of bars 2.34 cm diam. A mixed loading was also studied in which the 120 central channels were loaded with the new fuel element and the 520 channels with ordinary ones. This loading gave a thermal flux increase of 27.0% due to the reduced fuel element diameter and the use of magnox. The gain in fast flux would be 16%. (T.R.H.)

5132 NP-7137
Brussels. Centre d'Étude de l'Énergie Nucléaire.
THE EVALUATION OF THE EFFECT OF EIGHT CONTROL RODS IN THE BR-2 CORE. H. Dopchie. Apr. 1958. 15p.

An evaluation is presented of eight control rods symmetrically located in the core of the Belgian Reactor-2. Two-group theory was used. (W.L.H.)

5133 NP-7158
Brussels. Centre d'Étude de l'Énergie Nucléaire.
LE DANGER DES REACTEURS NUCLEAIRES. (The Danger of Nuclear Reactors.) H. Dopchie. Dec. 4, 1957. 34p.

A survey is presented on the dangers of nuclear reactors. The eight known past accidents are reviewed and discussed with respect to the possibility of a similar accident occurring in a power reactor. A brief study is made of a theoretically possible, but practically impossible, accident. It is concluded that the possibility of injury or death resulting from the industrial exploitation of nuclear energy is very low. (J.S.R.)

5134 NP-7162
Brussels. Centre d'Étude de l'Énergie Nucléaire.
MESURE DES FLUX DE NEUTRONS. (Measurement of the Neutron Flux.) J. Debrue. July 16, 1958. 7p.

A method of continuous neutron flux measurement is described in which a detector wire (In or Au) is placed in the reactor and unrolled in front of a counter with a recorder. Actually a series of counters (5 in general) is used, each side of the wire being turned successively toward the detector of the counter and the values subsequently averaged. (T.R.H.)

5135 NP-7163
Brussels. Centre d'Étude de l'Énergie Nucléaire.
BEPALING VAN DE NEUTRONEN FLUX DOOR DE OPBRENGST AAN SPLIJTPRODUKTEN. (Determination of the Neutron Flux by the Yield in Fission Products.) P. Schonken. Apr. 21, 1958. 6p.

The determination of the neutron flux by the yield of fission products is discussed. A method is given for this determination by the separation and counting of Ba activity from a uranium sample exposed to the neutron flux. (J.S.R.)

5136 NYO-8897
RCA Service Co., Inc., Camden, N. J.
COMPUTER DESCRIPTION—APPR-1 SIMULATOR. Dec. 15, 1958. 29p. Contract AT(30-3)-320. $6.30 (ph OTS); $3.00(mf OTS).

The APPR-1 Reactor is a pressurized water reactor having a fuel of low specific heat and water as primary coolant. The primary coolant loop delivers heat from the reactor to the steam generator. The secondary water in the steam generator is converted to steam and then taken to the turbine to drive the electrical generator. The simulation of this system is broken down into three primary areas: the neutron kinetics in the reactor which are necessary to generate the primary power function; the heat transfer in the reactor; and the heat transfer in the steam generator. Information presented is evaluated on the visual effect on the operator of the simulator. In many cases it is not necessary that the variables being presented have the correct absolute value, provided that the form of the variable is correct and the effect on the operator is the same as if the correct absolute value is being presented. This philosophy permits the simplification of many equations. An important characteristic of this simulator is that interlocks and safety circuits are provided to duplicate those in the reactor. Interlock relays prevent control rod withdrawal in "routine operation" if the primary coolant pumps are inoperative or if the reactor period is less than ten seconds. In the "zero power" mode, pump interlocks are bypassed, but a scram will occur if a 200-watt power level is exceeded or the period drops below ten seconds. (A.C.)

5137 ORNL-2448
Oak Ridge National Lab., Tenn.
OPERATING PROCEDURE FOR THE BULK SHIELDING REACTOR, FOURTH EDITION. K. M. Henry and F. C. Maienschein. Jan. 2, 1959. 27p. Contract W-7405-eng-26. $1.00(OTS).

The fourth revision of the statement of the procedure is presented. It is primarily for the guidance of reactor operators at the facility and contains procedures for operation, loading, reactor bridge movement, and emergency operation. Also included are block diagrams and check lists. (J.R.D.)

5138
RESEARCH REACTOR PLANTS. Joachim Ehrentreich. AEG Mitt. 48, 11-23(1958) Jan. (In German)

The research reactor types and their construction are discussed. The inventory possibilities and the development tendency to high flux reactors for material testing were considered and applied to plant and operating costs. Coolant and shielding problems were touched on, and the special meaning of the measuring and control techniques in research reactors were indicated. Completed and planned reactor constructions were considered as examples of construction and safety problems. (tr-auth)

5139
CONCRETE, THE CONVENIENT REACTOR SHIELDING. T. Jaeger. Atomic World 9, 416-18, 438(1958) Dec.

Information is presented on the composition of concrete for reactor shielding. Discussions are included on: shielding principles, the amount of water in the mix, increasing the density of concrete, high-density aggregates, thermal and chemical effects on concrete, the selection and kinds of aggregates, the addition of boron compounds to the mix, and cost factors. (J.H.M.)

5140
CALCULATION OF THE VALVES CONTROLLING THE COOLANT FLOWING THROUGH A NUCLEAR REACTOR. B. V. Florinskii. Atomnaya Energ. 5, 526-32 (1958). (In Russian)

REACTORS MODERATED BY D_2O-H_2O MIXTURES. R. Chalkley. Dec. 15, 1958. 6p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

Studies were made concerning the smallest core diameter and the most appropriate D_2O-H_2O composition ratio which would permit criticality in an HRT-type reactor; the fuel solution should contain no more than 10 g U/liter at 280°C. For the present core diameter of 32 inches (two-region operation), it was found that an addition of 10% light water to the moderator would reduce the critical concentration from 9.2 to about 7.8 g U/liter at 280°C (concentrations in g total U/liter, based on U of 93.4% enrichment). The smallest core diameter for which the reactor would remain critical with less than 10 g U/liter is about 29 inches. This occurred with a moderator composition of about 85% D_2O. (auth)

5126 IDO-16425

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

SPERT III HAZARDS SUMMARY REPORT. F. Schroeder. Jan. 14, 1958. 63p. Contract AT(10-1)-205. $1.75(OTS).

Spert III will be a heterogeneous, light-water-cooled and -moderated reactor, designed for operation at pressures up to 2500 psi and temperatures up to 670°F. The facility will be used for the performance of basic reactor kinetic studies designed to provide information for the advancement of pressurized-water, power-reactor safety and technology. This report discusses the major hazards present in the operation of this facility, the precautions to be taken to reduce the probability of an accident, and the consequences of the maximum possible accident. Brief descriptions of the Spert III design and the site location are also presented. It is concluded that the proposed method of operation and the site location make possible the operation of the Spert III facility without hazard to the general public. (auth)

5127 IDO-16455

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

PLUTONIUM SYSTEM STUDY WITH AN APPLICATION TO THE MTR. W. B. Lewis and G. D. Marshall. Nov. 20, 1958. 27p. Contract AT(10-1)-205. $1.00 (OTS).

Enriched plutonium as supplied for reactor fuel generally contains appreciable amounts of isotopes other than Pu^{239}. In order to estimate their effects on reactor behavior, various initial concentrations of Pu^{239}, Pu^{240}, and Pu^{241} have been considered using a simplified approach. In the first part, a constant thermal neutron flux and uniform burnout was assumed. Only thermal cross sections have been used with the neglect of the resonances in Pu^{239} and Pu^{240}. The ratio Σ_f/Σ_a for a plutonium system has been obtained as a function of time for three initial weight percentages of Pu^{239}, Pu^{240}, and Pu^{241}; 50-50-0, 35-65-0, and 20-80-0. It is found that this ratio begins to increase between the plutonium mixtures of 35-65-0 and 20-80-0. This means that the reactivity is aided by the growth of fissionable Pu^{241} from the other two isotopes, primarily as a first order product of Pu^{240}. The number of fission neutrons per thermal neutron absorbed, η, for a system initially containing only Pu^{239} and Pu^{240} has been plotted as a function of Pu^{239} weight percentage. A simulated reactor has been "run" through several cycles with an initial composition of 100-0-0. The N value of Pu was taken to be 10^{20} nuclei/cm^3 for the first cycle. Fuel processing for the successive cycles involved only the removal of fission products with increasing density to provide sufficient excess reactivity. The loss in reactivity due to initial presence of Pu^{240} in the plutonium fuel for the MTR has been calculated. Here account has been taken of the 1 ev Pu^{240} resonance and thermal flux depression in the fuel plates. Three values of the mass of plutonium per fuel element and three values of initial fraction of Pu^{240} have been considered. The reactivity loss ($-\delta k/k$) increases with increasing mass and with increasing fraction. For the present predicted MTR plutonium loading of 152 gms/assembly, an estimate of the initial group shim rod position has been made considering 4.5% Pu^{240} to be present initially. (auth)

5128 IDO-16471

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

TRANSIENT RESPONSE OF THE ETR PRIMARY WATER TEMPERATURE CONTROLLER. W. J. Byron and S. R. Gossmann. Nov. 14, 1958. 13p. Contract AT(10-1)-205. $0.50(OTS).

A rigorous analysis of the ETR with temperature feedback demanded the investigation of a separate loop whose function it is to keep the reactor inlet water temperature constant. It is to accomplish this by regulating the secondary water flow. In IDO-16448, Stability Analysis of the ETR With Reactivity Feedback Through the Temperature Coefficient by S. R. Gossmann, the problems of the stability analysis of the ETR would have been impossible if the present experiment had not been done, since there were no data quickly available on the transient or frequency responses of the components of this loop. As the report describes, the system did not lend itself to the frequency method. The transient response could be easily measured. The experiment and analysis are presented with the resulting transfer function (derived from the transient response) developed in the form used in IDO-16448. (auth)

5129 IDO-16501

Phillips Petroleum Co. Atomic Energy Div., Idaho Falls, Idaho.

ETR CONTROL ROD TEST FACILITY. E. S. Brown, J. H. Rainwater, and E. O. Smith. June 2, 1958. 87p. Contract AT(10-1)-205. (PTR-309). $13.80(ph OTS); $4.80(mf OTS).

Subsequent to the original tests of the control rod drive mechanism for ETR, many changes in materials and design were made. As a result it was decided to erect a test facility at the ETR to try out the revised control rod system. It was the object of these tests to determine the operability and durability of the control rod system, to establish the hydraulic characteristics of the control rod, and to obtain information for the maintenance of the ETR control system. The tests revealed that the design of the control rod was inconsistent with required performance criteria. The test facility was used to develop a more acceptable control rod. (W.D.M.)

5130 NP-7135

Brussels. Centre d'Etude de l'Energie Nucléaire.

INTERPRETATION DES EXPERIENCES CRITIQUES SUR BR-1. EVALUATION DU LAPLACIEN MATERIEL. (Interpretation of Critical Experiments on BR-1. Evaluation of the Laplacian.) J. P. Lagnaux. July 23, 1958. 13p.

The value of the material Laplacian was determined for six loadings of BR-1 by two methods. A value of $1.248 \pm 0.002 \times 10^{-4}$ is given. (T.R.H.)

5131 NP-7136
Brussels. Centre d'Étude de l'Énergie Nucléaire.
EMPLOI DE BARREAUX A AILETTES EN MAGNOX DE DIAMETRE REDUIT DANS BR-1. (Use of Rods with Magnox Fins of Reduced Diameter in the BR-1.)
J. Juliens and P. De Myttenaere. May 22, 1958. 19p.

Investigation of a reloading of BR-1 with fuel elements with variable diameter and finned magnox cladding is described. A thermal flux increase of 60% and fast flux increase of 45% were found. Thermal and nuclear considerations of this loading led to the recommendation of bars 2.34 cm diam. A mixed loading was also studied in which the 120 central channels were loaded with the new fuel element and the 520 channels with ordinary ones. This loading gave a thermal flux increase of 27.0% due to the reduced fuel element diameter and the use of magnox. The gain in fast flux would be 16%. (T.R.H.)

5132 NP-7137
Brussels. Centre d'Étude de l'Énergie Nucléaire.
THE EVALUATION OF THE EFFECT OF EIGHT CONTROL RODS IN THE BR-2 CORE. H. Dopchie. Apr. 1958. 15p.

An evaluation is presented of eight control rods symmetrically located in the core of the Belgian Reactor-2. Two-group theory was used. (W.L.H.)

5133 NP-7158
Brussels. Centre d'Étude de l'Énergie Nucléaire.
LE DANGER DES REACTEURS NUCLEAIRES. (The Danger of Nuclear Reactors.) H. Dopchie. Dec. 4, 1957. 34p.

A survey is presented on the dangers of nuclear reactors. The eight known past accidents are reviewed and discussed with respect to the possibility of a similar accident occurring in a power reactor. A brief study is made of a theoretically possible, but practically impossible, accident. It is concluded that the possibility of injury or death resulting from the industrial exploitation of nuclear energy is very low. (J.S.R.)

5134 NP-7162
Brussels. Centre d'Étude de l'Énergie Nucléaire.
MESURE DES FLUX DE NEUTRONS. (Measurement of the Neutron Flux.) J. Debrue. July 16, 1958. 7p.

A method of continuous neutron flux measurement is described in which a detector wire (In or Au) is placed in the reactor and unrolled in front of a counter with a recorder. Actually a series of counters (5 in general) is used, each side of the wire being turned successively toward the detector of the counter and the values subsequently averaged. (T.R.H.)

5135 NP-7163
Brussels. Centre d'Étude de l'Énergie Nucléaire.
BEPALING VAN DE NEUTRONEN FLUX DOOR DE OPBRENGST AAN SPLIJTPRODUKTEN. (Determination of the Neutron Flux by the Yield in Fission Products.) P. Schonken. Apr. 21, 1958. 6p.

The determination of the neutron flux by the yield of fission products is discussed. A method is given for this determination by the separation and counting of Ba activity from a uranium sample exposed to the neutron flux. (J.S.R.)

5136 NYO-8897
RCA Service Co., Inc., Camden, N. J.
COMPUTER DESCRIPTION—APPR-1 SIMULATOR. Dec. 15, 1958. 29p. Contract AT(30-3)-320. $6.30 (ph OTS); $3.00(mf OTS).

The APPR-1 Reactor is a pressurized water reactor having a fuel of low specific heat and water as primary coolant. The primary coolant loop delivers heat from the reactor to the steam generator. The secondary water in the steam generator is converted to steam and then taken to the turbine to drive the electrical generator. The simulation of this system is broken down into three primary areas: the neutron kinetics in the reactor which are necessary to generate the primary power function; the heat transfer in the reactor; and the heat transfer in the steam generator. Information presented is evaluated on the visual effect on the operator of the simulator. In many cases it is not necessary that the variables being presented have the correct absolute value, provided that the form of the variable is correct and the effect on the operator is the same as if the correct absolute value is being presented. This philosophy permits the simplification of many equations. An important characteristic of this simulator is that interlocks and safety circuits are provided to duplicate those in the reactor. Interlock relays prevent control rod withdrawal in "routine operation" if the primary coolant pumps are inoperative or if the reactor period is less than ten seconds. In the "zero power" mode, pump interlocks are bypassed, but a scram will occur if a 200-watt power level is exceeded or the period drops below ten seconds. (A.C.)

5137 ORNL-2448
Oak Ridge National Lab., Tenn.
OPERATING PROCEDURE FOR THE BULK SHIELDING REACTOR, FOURTH EDITION. K. M. Henry and F. C. Maienschein. Jan. 2, 1959. 27p. Contract W-7405-eng-26. $1.00(OTS).

The fourth revision of the statement of the procedure is presented. It is primarily for the guidance of reactor operators at the facility and contains procedures for operation, loading, reactor bridge movement, and emergency operation. Also included are block diagrams and check lists. (J.R.D.)

5138
RESEARCH REACTOR PLANTS. Joachim Ehrentreich. AEG Mitt. 48, 11-23(1958) Jan. (In German)

The research reactor types and their construction are discussed. The inventory possibilities and the development tendency to high flux reactors for material testing were considered and applied to plant and operating costs. Coolant and shielding problems were touched on, and the special meaning of the measuring and control techniques in research reactors were indicated. Completed and planned reactor constructions were considered as examples of construction and safety problems. (tr-auth)

5139
CONCRETE, THE CONVENIENT REACTOR SHIELDING. T. Jaeger. Atomic World 9, 416-18, 438(1958) Dec.

Information is presented on the composition of concrete for reactor shielding. Discussions are included on: shielding principles, the amount of water in the mix, increasing the density of concrete, high-density aggregates, thermal and chemical effects on concrete, the selection and kinds of aggregates, the addition of boron compounds to the mix, and cost factors. (J.H.M.)

5140
CALCULATION OF THE VALVES CONTROLLING THE COOLANT FLOWING THROUGH A NUCLEAR REACTOR. B. V. Florinskii. Atomnaya Energ. 5, 526-32 (1958). (In Russian)

Problems in the selection of a valve design are discussed. A method is offered for plotting a coolant control curve according to the experimental characteristics of the valve. Also a method is suggested for designing the shape of a valve according to the given control curve. As an example, calculations are presented for a valve with and without a coupling rod. (tr-auth)

5141
A LIQUID LOOP IN A REACTOR AS A RADIATION SOURCE — FOR RADIATION CHEMISTRY IN PARTICULAR. Yu. S. Ryabukhin and A. Kh. Breger. Atomnaya Energ. 5, 533-41(1958). (In Russian)

Certain aspects of reactor applications in radiation chemistry are discussed. An in-pile loop containing a liquid in which an activated material produces a single radioisotope is investigated. Formulas and working graphs are presented for calculating the parameters of a suitable γ radiation source and selecting the most efficient ones. (tr-auth)

5142
REPORT ON JAPAN DOMESTIC RESEARCH REACTOR NO. 1. Atoms in Japan 2, No. 10, 8-10(1958).

The research reactor to be built by the Japanese with their own materials and technology is a 10-Mw natural uranium heavy water graphite-reflected reactor. The design specifications are given along with the expected costs for core, building, and materials. Prospects are for criticality sometime in 1961. (W.D.M.)

5143
ANALOG COMPUTER STUDY OF THE TRANSIENT PERFORMANCE OF A DUAL-CYCLE BOILING-WATER-REACTOR NUCLEAR POWER PLANT. D. W. Leiby. Commun. and Electronics No. 35, 17-25(1958) Mar.

A general description is given of the Dresden nuclear power plant in which energy is withdrawn in the form of high-pressure steam obtained by direct boiling in the reactor and from low-pressure steam from a heat exchanger and used to supply the high- and low-pressure stages of a turbine. The steam flow controller is a valve linkage which combines the steam pressures at various points in the system with a hydraulic amplifier. The reactor power level is a function of the enthalpy of the inlet water to the core and is influenced by bubble concentrations, or voids, in the water. The simulation of this loop and others is described in general terms with several diagrams. The effects of various transients on the steam flow, pressure, turbine load output, and reactor power level are shown and discussed. (tr-auth)

5144
AEC SAFETY RESEARCH PROGRAM, REACTOR DESIGN FACTORS. Howard G. Hembree (U. S. Atomic Energy Commission, Washington). Ind. Eng. Chem. 51, No. 1, 85A-7A(1959) Jan.

The research falls into three logical categories: reactor kinetics and control, potential chemical reactions, and reactor containment. The first category includes inherent nuclear characteristics that might cause reactor runaway or shutdown. The second category includes such reactions as molten metal–water, metal–gas, and fission product release from fuel elements. The third includes both reactor core vessel and reactor containment shell integrity. (D.E.B.)

5145
PRIMER ON REACTOR FUSES. Nucleonics 17, No. 1, 84-5(1959) Jan.

Information is presented on the performance and operation of reactor safety fuses that use the energy from nuclear fission to trigger an auxiliary energy source to complete the action. This type of internal fuse can be divided into the following parts: trigger, primer, and propellant. In some cases it is possible to omit one or more of these parts, with the speed of response being improved thereby. The total energy required to disperse poison in a reactor may be reduced by selecting the poison that makes the greatest change in reactivity per gram of poison. Both natural boron and B^{10} are among the best poisons for thermal reactors. A trigger for an internal fuse that is actuated only by a short reactor period can be constructed from a bimetallic element made of plutonium and some other metal with the same thermal-expansion coefficient. A survey of possible propellants for internal fuses shows that the highest poison velocities are developed by shaped-charge propellants. Tests with a "shotgun"-type propellant system showed that poison may be shot into a reactor in less than 5 msec, and possibly in 1 msec. (J.H.M.)

Power

5146 AD-152239
Escher Wyss GmbH, Zurich.
APPLICATION OF THE CLOSED-CYCLE PRINCIPLE TO AIRCRAFT PROPULSION SYSTEMS. VOLUME VI, CHAPTERS 1 TO 4. GENERAL He–NAP CONSIDERATIONS. A. Burgorfer, R. Tognoni, and W. Spillmann. July 21, 1957. 40p. Contract AF61(514)-985.

The closed-cycle nuclear aircraft propulsion plant suggested in this study consists of: one main engine containing cooling fan, reactor, high-pressure turbine, recuperator, cooler, and compressor; and four ducted fans for propulsion, driven by 4 low-pressure turbines connected in parallel. Different plant configurations were investigated. Performance of the selected type was calculated for altitude 39,400 ft. An aircraft for which the power plant would be suitable has roughly been sized and compared with the DC 8. (auth)

5147 AECU-3683
Allis-Chalmers Mfg. Co., Milwaukee.
PATHFINDER ATOMIC POWER PLANT TECHNICAL PROGRESS REPORT [FOR] AUGUST 1957–MARCH 1958. Mar. 31, 1958. 81p. Contract AT(11-1)-589. (ACNP-5803). $2.25(OTS).

Progress is summarized in fuel element research and development, reactor mechanical studies, nuclear analysis, chemistry, instrumentation and control, plant safety analysis, feasibility studies, steam cycle, plant layout, materials and metallurgy, and site selection. (For preceding period see ACNP-5707.) (T.R.H.)

5148 AECU-3945
Duquesne Light Co., Shippingport, Penna.
DETERMINATION OF COEFFICIENTS OF REACTIVITY. SECTION I. 0-EFPH. Test Results DL-S-151 (T-550132). First Issue, Sept. 6, 1958. 43p. $7.80 (ph OTS); $3.30(mf OTS).

The temperature, pressure, and flow coefficients of reactivity at zero power were determined. The value of the temperature coefficient at the operating temperature of 523°F, with 0 EFPH plant operation, was 2.94 $(\Delta\rho/\Delta T) \times 10^{-4}$. The magnitude of the temperature coefficient at the plant operating temperature (523°F) indicates the reactor is very stable during normal operation. The pressure coefficient varies from 3.00 $(\Delta\rho/$

$\Delta P) \times 10^{-6}$ at 1200 psig to 2.38 ($\Delta\rho/\Delta P$) at 2000 psig, with a constant temperature. The flow coefficient was found to be insignificant and could not be accurately determined with the test equipment available. (auth)

5149 AECU-3946
Duquesne Light Co., Shippingport, Penna.
DETERMINATION OF COEFFICIENTS OF REACTIVITY. SECTION I. SECOND PERFORMANCE – EFPH = 156. Test Results DL-S-151 (T-550132). First Issue, Sept. 6, 1958. 47p. $7.80(ph OTS); $3.30(mf OTS).

The temperature and pressure coefficients of reactivity at zero power and 156 EFPH on the core were made. The results are inconclusive; the data obtained during the performance of the test are erratic. A steam bubble was not formed in the pressurizer, and large pressure variations occurred during the test. This may have caused the poor data. (auth)

5150 AECU-3947
Duquesne Light Co., Shippingport, Penna.
SAFETY RADIATION LEVEL SURVEY. SECTION II. Test Results DL-S-157. First Issue, Sept. 16, 1958. 9p. $1.80(ph OTS); $1.80(mf OTS).

A determination was made of the level of the radiation field in the non-nuclear portions of the plant during the first power run and following significant power runs. All radiation levels were background level readings. No neutrons were detected. Since this portion of the plant was surveyed during 100% power and background radiation was recorded, future surveys will be compared to this initial survey for verification. (auth)

5151 AECU-3951
Duquesne Light Co., Shippingport, Penna.
TEST FOR SHIELD DEFECTS. SECTION I. Test Results DL-S-171 (T-612083). First Issue, Sept. 18, 1958. 5p. $1.80(ph OTS); $1.80(mf OTS).

A study was made of the construction defects in shielding. As discernible from within the 1C Boiler Compartment, the shield wall separating the 1A Boiler Compartment and the 1C Boiler Compartment has no construction defects. This determination was made with the plant at approximately 45% reactor power. (auth)

5152 AECU-3952
Duquesne Light Co., Shippingport, Penna.
INITIAL RADIATION SURVEY. SECTION I. Test Results DL-S-172 (T-612084). First Issue, July 30, 1958. 8p. $1.80(ph OTS); $1.80(mf OTS).

The radiation levels in the reactor plant boiler chambers during plant operation were determined. The mean radiation level in the 1C boiler compartment with the 1A, 1B, and 1D coolant loops in service at 45% reactor power was 0.5 mr/hr with the plant at 88% power (59 Mw gross) the mean radiation level was 0.56 mr/hr. The data for Channel 5 of the operational radiation monitoring system contains consistent zero readings for parts of this test. An explanation for these readings may be that the channel was not functioning properly if at all, or the channel was not properly read. (auth)

5153 AECU-3955
Duquesne Light Co., Shippingport, Penna.
FLOW COASTDOWN TEST. SECTION 1. Test Results DL-S-179 (T-612087). First Issue, Oct. 16, 1958. 27p. $4.80(ph OTS); $2.70(mf OTS).

The rate of flow coastdown of the coolant in the reactor coolant system upon loss of power to the coolant pumps was determined. The rate of flow coastdown (per cent of initial flow) during the first six seconds after loss of power to the coolant pumps is faster than predicted but is considered to be in the satisfactory range. The fastest rate of flow coastdown is obtained by the simultaneous shutdown of all four coolant pumps from fast speed. Flow continues for at least 25 sec. after shutdown of coolant pumps. (auth)

5154 AECU-3957
Duquesne Light Co., Shippingport, Penna.
1B BOILER HEAT EXCHANGER TILT TEST. SECTION I. Test Results DL-S-224. First Issue, Oct. 10, 1958. 4p. $1.80(ph OTS); $1.80(mf OTS).

5155 AECU-3958
Duquesne Light Co., Shippingport, Penna.
REACTIVITY LIFETIME. SECTION I. FIRST PERFORMANCE. Test Results DL-S-225 (T-612118). First Issue, Oct. 24, 1958. 143p. $22.80(ph OTS); $7.20(mf OTS).

Performance and reliability of the PWR plant and core were determined under normal and steady-state conditions at ~60 Mw net electrical output. During operation there were two safety shutdowns, one planned shutdown and one safety insertion. The plant operated the first 275 hr without a significant core flux tilt occurring. During the next 460 hr numerous core flux oscillations occurred, and six of the oscillations required suppression using the control rods. No significant flux oscillations occurred during the last 275 hr of the test. Other than the above mentioned incidents and except for minor auxiliary system difficulties the PWR plant operated normally and satisfactorily during the test. (W.L.H.)

5156 AECU-3982
Duquesne Light Co., Shippingport, Penna.
CORE INSTRUMENTATION CALIBRATION. SECTION V. THIRD PERFORMANCE. Test Results DL-S-162 (T-550128). First Issue, Dec. 1, 1958. 5p. $1.80(ph OTS); $1.80(mf OTS).

The calibration of the core thermocouples in the Shippingport PWR is reported. (L.T.W.)

5157 AFOSR-TR-58-32
Escher Wyss GmbH, Zurich.
APPLICATION OF THE CLOSED-CYCLE PRINCIPLE TO AIRCRAFT PROPULSION SYSTEMS. VOLUME VIII, CHAPTERS 1 TO 9. SIZING OF THE COMPONENTS OF A CLOSED-CYCLE He–NAP SYSTEM. (Cover carries title: CLOSED CYCLE AIRCRAFT PROPULSION SYSTEMS). A. Burgdorfer, R. Tognoni, and W. Spillmann. July 21, 1957. 50p. Contract AF61(514)-985. (AD-152241).

Work on sizing of axial compressor, turbines, fans, recuperator, cooler, ducting, and auxiliaries for a helium closed-cycle nuclear aircraft propulsion system is described. (T.R.H.)

5158 APAE-Memo-157
Alco Products, Inc., Schenectady, N. Y.
THERMAL DESIGN CRITERIA FOR APPR PRESSURIZED WATER REACTORS. J. Love. Nov. 26, 1958. 28p. Contract AT(30-3)-326. $4.80(ph OTS); $2.70 (mf OTS).

The criteria established for thermal design of APPR pressurized water reactors are given. These include heat transfer coefficient, power distribution utilization, hot channel factors, lattice requirements, and instrumentation tolerances. Calculations are shown for hot channel factors, lattice requirement determination, and heat release distribution. (T.R.H.)

5159 CEND-0005-RS-41
Combustion Engineering, Inc. Nuclear Div., Windsor, Conn.
SUMMARY OF PROGRESS IN UNCLASSIFIED AREAS OF REACTOR TECHNOLOGY. Oct. 15, 1958. 24p. $0.75(OTS).

A general method of solving coupled, first-order differential equations has been developed. A double spherical harmonic approximation is presented for cylinders. Tests have been made of a cermet billet type silver–silver chloride electrode for chloride ion analysis in reactor cooling water. (W.L.H.)

5160 CF-56-1-30(Del.)
Oak Ridge National Lab., Tenn.
HIGH TEMPERATURE CERAMIC POWER REACTORS USING SiC–Si FUEL ELEMENT. J. R. Johnson, R. L. Hamner, A. J. Taylor, and J. M. Warde. Jan. 10, 1956. Decl. with deletions Jan. 24, 1957. 39p. Contract [W-7405-eng-26]. $6.30(ph OTS); $3.00(mf OTS).

The high-temperature properties of ceramic materials for possible use in a gas-cooled power breeder reactor are presented. A detailed design of a gas-cooled power breeder reactor is presented. (W.L.H.)

5161 CF-58-7-65
Oak Ridge National Lab., Tenn.
REVIEW OF S AND P 1963, THE PEBBLE BED REACTOR. July 17, 1958. 48p. Contract [W-7405-eng-26]. $7.80(ph OTS); $3.30(mf OTS).

Sanderson and Porter, under contract to the AEC, prepared a design feasibility study for a pebble-bed reactor steam power plant of 125-Mw(e) capacity. The design problems, economic considerations, and required research and development programs were reviewed by ORNL. It is concluded that the design shows promise of being economically competitive if the following conditions are met: (1) U^{233} could be made available for use as a burner rather than as a breeder; (2) the contamination problems within the reactor can be successfully handled in a manner which would permit direct maintenance on the equipment external to the core; and (3) the anticipated lifetime of the fuel is sufficiently long to justify the cost assumptions of the Sanderson and Porter design. (L.T.W.)

5162 CF-59-1-22
Oak Ridge National Lab., Tenn.
PROPOSED NEW BASIS FOR ESTIMATING FIXED CHARGES IN FUTURE NUCLEAR PLANTS. J. A. Lane. Jan. 12, 1959. 5p. Contract [W-7405-eng-26]. $1.80(ph OTS); $1.80(mf OTS).

The use of conventional financing methods to estimate fixed charges and power costs in various nuclear plants is shown to lead to erroneous conclusions. A new method is proposed which better assesses the relative merits of high fuel inventory–low fuel cost reactors compared to low fuel inventory–high fuel cost systems. (auth)

5163 GA-179(Pt. I)
General Atomic Div., General Dynamics Corp., San Diego, Calif.
SUPPLEMENTARY STUDIES ON GAS-COOLED REACTOR FOR MARINE PROPULSION. W. I. Thompson, E. Bjørnerud, L. H. Chen, G. Hinman, A. C. McClure, D. Nicoll, H. Poppendiek, N. Rostoker, G. Schnurer, and G. Webb. Aug. 14, 1957. 104p. Project No. 16. Contract AT(04-3)-118. $16.80(ph OTS); $5.70(mf OTS).

The feasibility of a marine-propulsion power plant, based on the use of a hydride-moderated gas-cooled reactor, is presented. The principal emphasis in these studies was directed towards hazards problems, which were approached from the point of view of reactor and power-plant transient analysis and selected reactor accidents. Further efforts were devoted to certain essential design problems, including the design of equipment to remove reactor after-heat, design of control-rod drive mechanisms, and the design of fuel elements. There is also included a summary and analysis of information on CO_2, which is needed for the design of the power plant. (W.L.H.)

5164 HW-58019 A2
General Electric Co. Hanford Atomic Products Operation, Richland, Wash.
DIVISION OF REACTOR DEVELOPMENT PROGRAMS MONTHLY REPORT [FOR] OCTOBER 1958. L. H. McEwen, comp. Nov. 15, 1958. 26p. Contract W-31-109-Eng-52. $4.80(ph OTS); $2.70(mf OTS).

The Al–Pu alloy capsules undergoing tests in the MTR and the KER in-pile loop are discussed. The first full-size Mark 1-B, 19-rod cluster assembly has been fabricated and delivered to 100-KE for thermal cycle and pressure drop tests. Irradiation of UO_2 in the MTR is discussed. The tests being performed on the Plutonium Recycle Reactor Experiment coolant system pumps, valves, and piping are reported. (For preceding period see HW-57636 A2.) (W.L.H.)

5165 KAPL-M-RPS-5(Del.)
Knolls Atomic Power Lab., Schenectady, N. Y.
THE POTENTIAL SIMPLIFICATION OF REACTOR REPROCESSING BY THE PROPER CHOICE OF REACTOR SYSTEMS AND BY THE REMOVAL OF ONLY THE SERIOUS FISSION PRODUCT POISONS. Robert P. Schuman and Arthur D. Tevebaugh. Dec. 11, 1950. Decl. with deletions Feb. 27, 1957. 33p. Contract W-31-109-Eng-52. $6.30(ph OTS); $3.00(mf OTS).

This is a deleted version of a report also identified as MEMO-RPS-5.

The poisoning effects of capture and fission products were investigated for U^{233} and U^{235} thermal reactors. Several systems which appear to lend themselves to simplified fuel reprocessing in homogeneous power breeder reactors are discussed. (D.E.B.)

5166 NDA-2562-1(Vols. I and II)
East Central Nuclear Group and Babcock and Wilcox Co. [Atomic Energy Div., Lynchburg, Va.].
STEAM-COOLED REACTOR FEASIBILITY STUDY STEAM WATER REACTOR (SWR). Volume I (Sections 1-6). Volume II (Sections 7 and 8). Final Report. Aug. 15, 1958. (Vol. I, 58p.; Vol. II, 213p.). For Nuclear Development Corp. of America.

These two reports were issued separately, but are cataloged as a unit.

The concept feasibility study is reported for a 200-Mwe, 530-Mwh reactor. Steam at 2200 psi enters the reactor. Forty percent of the steam is heated in the peripheral region to 1050°F and flows to the turbine. Sixty percent is heated to 950° and vaporizes the water from the condensers. A low-pressure Al tank containing D_2O moderator is mounted horizontally in graphite. Horizontal Zircaloy pressure tubes for the stainless steel-clad UO_2 fuel rods and steam coolant go through the Al tank. Thermal insulation between pressure tubes and moderator must be provided. Energy costs and other characteristics of the reactor are given. It is

concluded that the development work required to achieve this type of reactor is worthwhile, and a recommended development program is outlined. (T.R.H.)

5167 NDA-Memo-14-27

Nuclear Development Associates, Inc., White Plains, N. Y.

USE OF UO_2 IN IRON MATRIX FOR FAST REACTOR FUEL ELEMENT. Wayne H. Jens. Feb. 26, 1954. Decl. May 28, 1958. 8p.

Work performed under contract with the Detroit Edison Co. and the Dow Chemical Co.

Although the type of fuel element of UO_2 in Fe matrix can be used in a fast reactor, it is not desirable since a large loss in conversion ratio or breeding gain will result. In addition a great deal of the flexibility obtained by adding U^{238} to the core is removed. If serious consideration is to be given chemical reprocessing it might be well to reexamine the whole design basis of the fuel element. The present fuel element appears to have originated because of the contemplated metallurgical reprocessing and the need for casting fuel directly from the reprocessing cycle. With chemical reprocessing there is no clear cut need to use a casting technique. (auth)

5168 NP-7071

MSA Research Corp., Callery, Penna.

FISSION PRODUCT RELEASE DURING A SIMULATED MELTDOWN OF A PWR TYPE CORE. Technical Report No. 63. S. J. Rodgers and G. E. Kennedy. Oct. 20, 1958. 40p. Contract NObs-65426.

Zircaloy-2 clad uranium–zirconium alloy fueled subassemblies were used in a mockup of a PWR-type core meltdown. The subassemblies were melted in a steam atmosphere, and the characteristic mode of meltdown and the release and distribution of fission products were evaluated. Physical damage to the subassemblies as a result of both melting and the zirconium–steam reaction was extensive with as much as 20% of the material being consumed in the metal-steam reaction. Partial plugging of the channels was noted in all cases and in one instance complete plugging of all of the channels was noted. Release of molten metal from the subassemblies was in the form of streams rather than droplets. The major fission product release was in the form of rare gas with 42 to 58% of the xenon released from the subassembly. The major non-gaseous product released was iodine with as much as 25.8% escaping from the subassembly. The release of strontium, barium, yttrium, cesium, and cerium from the subassemblies ranged from 0.4 to 1.6%, depending upon the conditions of meltdown. The rate of meltdown had its greatest effect on iodine with 1.3 to 7.6% released during fast meltdown and 7.9 to 25.8% released during slow meltdown. No significant change was noted when the molten mass dropped into a reservoir of water positioned beneath the subassembly. (auth)

5169 SCNC-268

Sylvania-Corning Nuclear Corp., Bayside, N. Y.

MAJOR FACTORS AFFECTING BURN-UP OF NUCLEAR FUEL ELEMENTS. M. Belicki, A. Machonis, and H. P. Kling. Oct. 1958. 24p. Contract AT-30-1-GEN-366.

Problems of burnup of nuclear fuel elements are treated. The factors which determine the percentage of fissionable material in a nuclear fuel destroyed by fission or capture are reviewed and analyzed. The causes for premature withdrawal of fuel elements, for failure from core or fuel element design, fabrication defects, and reactor operating conditions, are analyzed. Suggestions for improving the burn-up are given. It is further proposed to collect data for an "Atlas of Fuel Elements and Their Burn-up Relations." An example for this "Atlas" is given in the appendix describing the fuel elements in the BNL-1 reactor and their performance. Attempts have been made to correlate fuel element performance with design. (auth)

5170 VAL-33

General Electric Co. Vallecitos Atomic Lab., Pleasanton, Calif.

LEAKAGE TESTING ON THE BOILING WATER REACTOR ENCLOSURE. S. Untermyer and D. L. Layton. Sept. 1957. 15p.

The Vallecitos Boiling Water Reactor vessel housing did not have any measurable leaks at the time when the structure was completed prior to the installation of concrete foundations, shielding, and equipment. The test as conducted proved the structural soundness of the vessel and demonstrated a sensitive rapid method for measuring leakage rates without expensive and intricate equipment for temperature compensation. After equipment installation and control cable penetration, the vessel was retested and results showed the leakage rate to be less than 1% at the rated pressure of 45 psi. (W.D.M.)

5171 WAPD-ADT(C)-28

Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.

S1W-3 (CORE 4) DATA REDUCTION AND PROCESSING. G. H. Conley. Mar. 26, 1956. 6p. $1.80(ph OTS); $1.80(mf OTS).

The recommended instrumentation scheme is described, and requirements for data processing equipment are given with the reasons supporting the requirements. (J.R.D.)

5172 WAPD-MRP-76

Westinghouse Electric Corp. Bettis Plant, Pittsburgh.

PRESSURIZED WATER REACTOR (PWR) PROJECT TECHNICAL PROGRESS REPORT FOR THE PERIOD AUGUST 24, 1958 TO OCTOBER 23, 1958. 82p. Contract AT-11-1-GEN-14. $2.25(OTS).

An evaluation of the fission product activity levels during the 1000-hr full power run indicates the PWR core has one or more failed blanket rods. Rod drop transient tests were conducted and an evaluation made. A feasibility study has revealed that thermal and pressure cycling performed to date on core 1 does not limit the possibility of converting the reactor vessel test head to an operational head. Results obtained thus far on the PWR stress corrosion program indicate 1,150°F tempered 410 stainless steel is feasible for motor tubes. Test results to date on core 2 indicate that the $1\frac{3}{4}$-in.-diam. buffer piston will provide the deceleration necessary to limit impact velocity and control rod shafting stresses to acceptable values. Simulated water logging tests were conducted on wide fuel compartments. Fission gas release from compartmented-plate fuel elements was a factor of 1.5 to 2.0 higher from compartments containing Al_2O_3–UO_2 fuel than from compartments containing undiluted UO_2. Examination of Zircaloy tensile specimens of modified composition exposed in an in-pile hot water loop verified that addition of nickel increases hydrogen absorption. No dimensional changes were noted in copper diffusion bonded compartmented fuel plates after 1.6 at. % burnup. Oxide plate fuel ele-

ment samples of high compartment integrity have been successfully fabricated. A means of protecting Ag–15 In–5 Cd alternate control material alloy from corrosion attack in oxygenated water was developed. A two-dimensional depletion study of core 1 was carried through 3000 EFPH of core life. An extensive series of one-rod-stuck shutdown measurements was performed in the core 2 mock-up in order to determine the effects on shutdown of B^{10} lumps. An experiment was performed in which the hydrogen density was reduced in the seed fuel region of the core 2 mock-up by the introduction of foamed plastic tape into the water channels in the seed. (For preceding period see WAPD-MRP-75.) (W.D.M.)

5173 WAPD-PWR-RD-404
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
PWR REACTOR VESSEL (BACK-UP SEAL DEVELOPMENT PROGRAM). P. A. Halpine. Jan. 22, 1957. 6p. $1.80(ph OTS); $1.80(mf OTS).

The back-up seal program for developing a secondary seal between the PWR reactor vessel closure head and the penetration housing is presented. (W.L.H.)

5174 WAPD-PWR-RD-603
Westinghouse Electric Corp. Atomic Power Div., Pittsburgh.
PWR SEED METAL THERMOCOUPLES. N. J. Palladino. May 9, 1958. 7p. $1.80(ph OTS); $1.80 (mf OTS).

The failure of the 0.040-in.-diam. stainless steel sheathed thermocouples employed in PWR Seed 1 for the measurement of seed metal temperature and the subsequent investigations to determine their usefulness and cause of failure are described. (W.L.H.)

5175 WAPD-SC-531(Del.)
Westinghouse Electric Corp. Bettis Plant, Pittsburgh.
SUMMARY REPORT ON REACTOR HAZARDS ASSOCIATED WITH THE PRESSURIZED WATER REACTOR FLEXIBLE ASSEMBLY—II. Frank Feiner. May 14, 1956. Decl. with deletions Apr. 24, 1958. 22p. Contract AT-11-1-GEN-14. $4.80(ph OTS); $2.70(mf OTS).

In the past, the critical experimentation facility Pressurized Water Reactor Flexible Assembly II (PWR-FA) has employed plastic tapes containing highly enriched U_3O_8 as the fuel. Due to a phase transition in the polyethylene near 40°C which changes the elastic constants of the plastic and may limit the range over which meaningful temperature coefficient measurements may be made, metallic fuel elements were investigated as a possible replacement. (W.L.H.)

5176 YAEC-101
Westinghouse Electric Corp. Atomic Power Dept., Pittsburgh.
MONTHLY PROGRESS REPORT FOR THE PERIOD OCTOBER 1 TO 31, 1958. R. W. Garbe and H. E. Walchli. Nov. 20, 1958. 18p. For Yankee Atomic Electric Co. Contract AT(30-3)-222, Subcontract No. 1. $3.30(ph OTS); $2.40(mf OTS).

The research and development required to build a 134-Mw(e) pressurized-water nuclear power plant having a core of slightly enriched uranium dioxide fuel pellets contained in stainless steel tubes are described for Oct. 1958. Corrosion testing of nickel-plated Cd–In–Ag control rod alloy is described. Preliminary results from hydrostatic pressure testing of various types of stainless steel tubing are presented. (For preceding period see YAEC-99.) (W.D.M.)

5177 YAEC-103
Westinghouse Electric Corp. Atomic Power Dept., Pittsburgh.
MONTHLY PROGRESS REPORT FOR THE PERIOD NOVEMBER 1 TO 30, 1958. R. W. Garbe and H. E. Walchli. Dec. 20, 1958. 16p. For Yankee Atomic Electric Co. Contract AT(30-3)-222, Subcontract No. 1. $3.30(ph OTS); $2.40(mf OTS).

Work directed toward developing a stainless steel clad UO_2 fuel element is reported. Methods are being developed for utilizing chemical poisoning for reactor control and studying the crud and corrosion problems in the reference environment. The design and development of mechanical features of fuel assemblies, control rods, baffles, the support structure, the reactor vessel closure, and fuel handling tools are presented. (For preceding period see YAEC-101.) (W.L.H.)

5178 AEC-tr-3437
NUCLEAR ENERGETICS. (Yadernaya Energetika). D. I. Voskoboinik. Translated from a publication of the State Publishing House for Technical–Theoretical Literature, Moscow, 1956. 135p. $2.50(OTS).

A study of the design principles and operating characteristics of nuclear power plants is presented. The operating electric nuclear power station of the Academy of Sciences of the USSR, as well as the nuclear power stations mentioned in Soviet and foreign publications, is described. Particular emphasis is given to materials for nuclear reactors as well as to specialized equipment. The book is intended for a broad readership without specialized training. (W.D.M.)

5179
NUCLEAR POWER IN SOUTH AUSTRALIA. S. E. Huddleston. Atomic Energy 2, No. 1, 17-21(1958) Dec.

Economic considerations are given to the future development of nuclear power in South Australia. Present fuel cost, coal resources, and present and future power demands are considered. Present conditions indicate that South Australia will be seeking nuclear power about 1970. (J.H.M.)

5180
NUCLEAR ENERGY IN ITALY. I. F. Quercia. Civiltá macchine 6, 18-23(1958) May-Aug. (In Italian)

In the absence of a detailed plan for the development of the nuclear energy industry in Italy, an estimate is made of future requirements by which Italy's annual consumption of electricity will have risen to 75×10^9 kwh by 1965, of which 30×10^9 will be generated in thermal plants. The high cost of importing the requisite fuel could be reduced by about a half by the erection of nuclear power plants capable of generating 12 to 14×10^9 kwh a year. A cost comparison requires consideration of legislation in the nuclear field, geological exploration, choice of reactor types, use of most advanced technology, fundamental research, and training of staff. It is estimated that if all Italian plans come to fruition, within five years Italy's nuclear potential (in terms of men, investments, and facilities) will be about one-eighth of France's present potential. (tr-auth)

5181
THE ECONOMICS OF REACTORS OF THE CALDER HALL TYPE. P. H. W. Wolfe. Elec. J. 160, 1729 (1958) June 6.

Using a bank rate of 6% and an efficiency of 27% and assuming a 15-year amortization, 80% load factor, 3,000 Mwd/t fuel life, and £15,000/ton fuel replace-

ment cost, a 500 Mw nuclear power station would cost 0.425d/unit in capital costs and 0.185d/unit in fuel costs, totalling 0.61d/unit (7.2 mill). To this would have to be added operating costs, maintenance, and time charges for the fuel on the site. The bases of these figures and the relative costs of other types of reactors are discussed. (auth)

5182
THE FUTURE OF BOILING-WATER REACTORS. J. M. West and G. M. Roy (General Nuclear Engineering Corp., Dunedin, Fla.). Nucleonics 17, No. 1, 42-8(1959) Jan.

From the analysis of performance data from the Experimental Boiling Water Reactor (EBWR), estimates are presented for the performance and costs of future boiling-water reactor plants. Experimental data indicate that both EBWR and Borax IV are stable in operation even though they have much more reactivity invested in steam voids than did earlier boiling reactors. The operation of these natural-circulation reactors at high steam-void fractions permits an increase in power density large enough to virtually eliminate earlier concern about power-density limitations in this reactor type. To escape the U metal–water hazard, future boiling reactors will turn to UO_2 fuel. Since the oxide is half as dense as the metal, substitution of UO_2 in a natural-circulation boiling reactor would mean a substantial increase in core size for the same output. However, for small reactors the layer core would still be less expensive than using forced circulation. Small EBWR-type reactors appear to have the lowest capital cost (estimated at $300 to $350/kwh(e)) of any reactor type. In large reactors the design modifications needed to maintain a high power density with natural circulation make forced circulation more economical. Large forced-circulation plants if built today on U. S. industrial sites would cost $250 to $300/kwh(e). (J.H.M.)

5183
FAST OXIDE BREEDER. FUEL CYCLE AND COST. J. K. Davidson, R. S. Miller, and D. J. Smith (Knolls Atomic Power Lab., Schenectady, N. Y.). Nucleonics 17, No. 1, 88-93(1959) Jan.

The fast breeder is of long-range interest because it is based on one of the two fuel systems (a thermal reactor with Th–U^{233} cycle is the other) that can produce more fissionable material than it uses. The oxide-fuel cycle (UO_2–PuO_2) in a fast breeder is of particular interest because it appears possible to arrive at a fuel-cycle cost low enough to make this system of short-range interest as well. The reactor, economic analysis, and fuel-cycle development are considered. (L.T.W.)

5184
NUCLEAR PROPULSION. J. Edwards (Atomic Energy Research Establishment, Harwell, Berks, Eng.). Research (London) 12, 26-35(1959) Jan.

The economics of nuclear power for ship propulsion and the types of reactor systems which could best be used for mobile reactors are summarized. It is pointed out that mobile reactors present difficult shielding problems as weight must usually be kept at a minimum. (auth)

5185
ATOMIC HEATING PLANT AT FARSTA. O. Berg. Tidsskr. Värme-Ventilations Sanitets 28, No. 10, 309-15(1957).

The requirements are given concerning the safety distance from built-up areas and other safety measures for the reactor buildings, at present containing a purely thermal reactor, later to be changed to a high-temperature high-pressure reactor for simultaneous heat and power production. The reactor is housed in the rock, from which the heat will be conducted in a 4-km pipe culvert with 600-mm pipes. (auth)

5186
NUCLEAR REACTORS FOR POWER GENERATION. E. Openshaw Taylor, ed. London, George Newnes Limited, 1958. 148p.

The course of lectures upon which this book is based was delivered at the Heriot-Watt College, Edinburgh. It is intended primarily for that increasingly large group of engineers who will be closely associated with the building and operation of nuclear power stations without necessarily being responsible for their actual design. Sections are presented on nuclear physics, reactor types, materials, design, safety and instrumentation, and economics. (W.D.M.)

TECHNOLOGY

Feed Materials

5187 AECD-4275
National Lead Co. of Ohio, Cincinnati.
EQUIPMENT FOR MEASUREMENT OF INTERNAL TEMPERATURES IN SCREW REACTORS. F. M. Teetzel, J. A. Williamson, A. E. Abbott, and R. L. Maddox. Aug. 1958. Decl. Oct. 7, 1958. 17p. $3.30 (ph OTS); $2.40(mf OTS).

Uranium dioxide is produced in large screw-type reactors by contacting uranium trioxide with hydrogen at elevated temperatures. The temperature of the system is a critical variable and is difficult to determine due to physical arrangement of the equipment. The use of sheathed thermocouples and the use of a mercury commutator for transmitting small electrical signals from a rotating member to stationary contacts have permitted the recording of internal reactor temperatures while the reaction was being carried out. (auth)

5188 NLCO-762
National Lead Co. of Ohio, Cincinnati.
LABORATORY AND PILOT PLANT EVALUATION OF STANROCK URANIUM CONCENTRATE. Nelson R. Leist, Clark T. Hicks, and Joseph R. Nelli. Oct. 10, 1958. 29p. Contract AT(30-1)-1156. $1.00(OTS).

The laboratory and pilot plant evaluation of Stanrock concentrate is presented. This concentrate meets all FMPC impurity tolerance limits except that for thorium content. The thorium limit can be met by the addition of phosphate as required for thorium-containing uranium concentrates. Laboratory digestion and extraction tests indicate that this material should present no problems in pulse column processing. A pilot plant pulse column test (a test utilizing a modified two-inch-pulse-column system) indicated that this material should present no operational problems in the National Lead Company of Ohio Refinery. (auth)

5189 NLCO-763
National Lead Co. of Ohio, Cincinnati.
LABORATORY AND PILOT PLANT EVALUATION OF RAYROCK URANIUM CONCENTRATE. Nelson R. Leist, Clark T. Hicks, Jerome H. Krekeler, and Joseph R. Nelli. Oct. 17, 1958. 22p. Contract AT(30-1)-1156. $0.75(OTS).

The laboratory and pilot plant evaluation of Rayrock concentrate is presented. This concentrate meets all FMPC impurity tolerance limits. Laboratory digestion and extraction tests indicate that this material should not present processing problems in a pulse column system. A pilot plant pulse column test indicated that this material should present no operational problems in the National Lead Company of Ohio Refinery. (auth)

5190 NLCO-766
National Lead Co. of Ohio, Cincinnati.
LABORATORY EVALUATION OF LISBON URANIUM ORE. Clark T. Hicks, Nelson R. Leist, and Joseph R. Nelli. Oct. 22, 1958. 25p. Contract AT(30-1)-1156. $0.75(OTS).

The laboratory evaluation of Lisbon ore is presented. This material will require blending with a high-quality uranium concentrate such as South African because of its high nitric acid insoluble content and its low uranium assay. The material, when blended, meets all FMPC impurity tolerance limits except the limit for $(Ca \times SO_4^{-2})$. It is believed that this high impurity level will not hamper Refinery operation, provided that the material is processed for only a short term. Laboratory digestion and extraction tests indicate that the blend should present no serious problems in pulse column operation, provided that the as-received Lisbon ore is milled. Aqueous raffinate disposal studies indicate that the raffinate resulting from the extraction column processing of a very limited amount of this material can be safely discarded if a revised raffinate disposal process is used. (auth)

5191 NLCO-767
National Lead Co. of Ohio, Cincinnati.
LABORATORY AND PILOT PLANT EVALUATION OF DYNO URANIUM CONCENTRATE. Nelson R. Leist, Clark T. Hicks, and Joseph R. Nelli. Oct. 31, 1958. 25p. Contract AT(30-1)-1156. $0.75(OTS).

The laboratory and pilot plant evaluation of Dyno concentrate is presented. This concentrate meets all FMPC impurity tolerance limits except thorium and chloride limits. The thorium limit can be met by the addition of phosphate as required for thorium-containing uranium concentrates. The high chloride content of this material will necessitate blending of the material with a good quality low-chloride-containing concentrate in the National Lead Company of Ohio refinery process. Laboratory digestion and extraction tests indicate that this material should present no other problems in pulse column processing. A pilot plant pulse column test indicated that this material should present no operational problems in the National Lead Company of Ohio Refinery. (auth)

Raw Materials

5192 WIN-113
National Lead Co., Inc. Raw Materials Development Lab., Winchester, Mass.
RADIUM BALANCE IN THE MONTICELLO ACID R.I.P. URANIUM MILL. A. Whitman and R. G. Beverly. Dec. 30, 1958. 52p. Contract AT(49-6)-924. $7.80(ph OTS); $3.30(mf OTS).

A study of radium distribution through the Monticello Acid Resin-in-Pulp plant is presented. Emphasis is placed on the flow of radium through the process in an effort to determine the effect of the uranium treatment process on the dissolution and the ultimate disposition of radium. (auth)